Rice University
General Announcements
1987-88

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RICE

Rice University
General Announcements
Houston, Texas

1987-88

NOTE: This catalog represents the most accurate information available at the time of publication. However, it necessarily cannot reflect changes in staff and costs over the longer term. As far as courses are concerned, the departments have used their best judgment in anticipating which courses will be offered over the two-year period and when they will be offered. Despite their best efforts, though, the inevitable changes in faculty as well as student demand and even funding, in some cases, may affect course offerings. A good faith effort has been made to indicate these uncertainties appropriately.

Offices to contact for additional information:
Mailing Address: Rice University, P.O. Box 1892, Houston, Texas 77251
Location: 6100 South Main, Houston, Texas
Telephone: (713) 527-8101
Please address all correspondence to the appropriate office or department followed by the University mailing address given above.

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Housing for Undergraduates	Office of Admissions 109 Lovett Hall; (713) 527-4036
Undergraduate Students, Undergraduate Curricula	Office of the Vice-President for Student Affairs 101 Lovett Hall; (713) 527-4996

Rice University seeks to attract to its faculty, staff, and student body qualified persons of diverse backgrounds. In accordance with this policy, Rice does not discriminate in admissions, educational programs, or employment against any individual on the basis of sex, race, color, religion, age, national or ethnic origin, or handicap. University policy also includes affirmative action in seeking to attract to Rice women, minority group members, handicapped individuals, and veterans.

Table of Contents

The University and the Campus 1

Administration and Staff

- Board of Governors 4
- Administration 6
- Administrative Offices 6
- College Masters and Comasters 7
- Rice University Associates 8
- Instructional and Research Staff 13
- Standing Committees 50
- Chairs and Lectureships 50

Information for Undergraduate Students

- Degree Requirements, Majors, and Curricula 54
- Academic Regulations 68
- Extended Time Graduation 75
- Rice Tutorial Program 75
- Admission of New Students 75
- Tuition, Fees, and Expenses 81
- Financial Aid 84
- Scholarships and Awards 87
- Honor Societies 96
- Student Life 97

Information for Graduate Students

- Research Degrees 105
- Professional Degrees 106
- Admission to Graduate Study 110
- Tuition, Fees, and Expenses 113
- Fellowships, Scholarships, and Prizes 114
- Financial Aid 117
- Student Life 118

Courses of Instruction

- Explanation of Numbering System 121
- Accounting and Administrative Science 122
- Anthropology 132
- Architecture 139
- Art and Art History 150
- Biochemistry 161
- Biology 165

Chemical Engineering 187
Chemistry 170
Civil Engineering 192
Classics 329
Computer Science 198
Economics 174
Education 181
Electrical and Computer Engineering 203
Engineering and Applied Science 186
Environmental Science and Engineering 212
English 229
French and Italian 236
Geology and Geophysics 240
German and Slavic Studies 247
Human Performance and Health Sciences 252
History 257
Humanities 265
Italian 239
Linguistics and Semiotics 267
Managerial Studies 273
Materials Science/Engineering 221
Mathematical Sciences 215
Mathematics 273
Mechanical Engineering and Materials Science/Engineering 221
Military Science 277
Music 279
Naval Science 293
Philosophy 295
Physics 299
Policy Studies 303
Political Science 304
Portuguese 329
Psychology 310
Religious Studies 315
Slavic Studies 250
Sociology 320
Space Physics and Astronomy 324
Spanish, Portuguese, and Classics 329
Statistics 336
Academic Calendar 340

Index 342

The University and the Campus

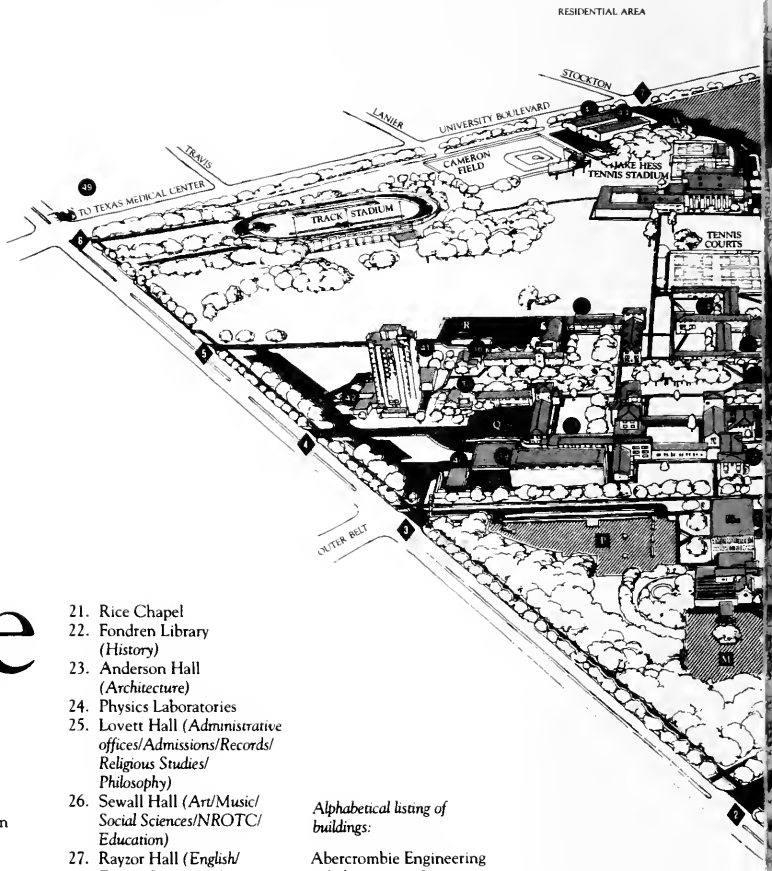
Dedicated to the "the advancement of letters, science, and art," Rice is private, independent, nonsectarian, and coeducational. It includes among its academic divisions both undergraduate and graduate studies in the humanities, social sciences, natural sciences, engineering, architecture, administrative sciences, and music.

Highly talented students with diverse interests are attracted to Rice by the opportunities for creative learning. They find rewarding student-faculty relationships, options for individually tailored programs of study, opportunities for research, cooperative activities with other insltitutions in the nation's fourth largest city, and the unique experience of residential colleges.

About 60 percent of Rice's 2,500 undergraduate students live on campus in the eight residential colleges. The colleges have independent student governments, plan social functions, form field intramural teams, and sponsor innovative academic courses, distinguished speakers, plays, and other functions. In each college, the college master, comaster, and approximately 20 faculty associates act as advisers to the students. This system provides students and faculty with a style of living in keeping with the tenets of fine education.

Rice's approximately 1,000 graduate students work closely with faculty members who are eminent in their fields and conduct innovative research to extend the horizons of current knowledge. Graduate students live off campus or in the University-owned Graduate House. The Graduate Student Association organizes and funds regular social activities and provides graduate students with a separate organization to represent their interests within the University.

A look through the archway of Lovett Hall shows even the casual visitor why the 300-acre Rice campus is widely acclaimed for its dignified yet casual beauty. Approximately 40 permanaent buildings are conveniently grouped in quadrangles under graceful live oak trees. The city's largest stadium, the Fondren Library, the Media Center, the gymnasium, and the computer center as well as its dramatic and musical presentations make Rice "behind the hedges" a community unto itself. Yet, only three miles from downtown Houston, Rice students enjoy all the commercial and cultural advantages of a major metropolitan center.



Rice

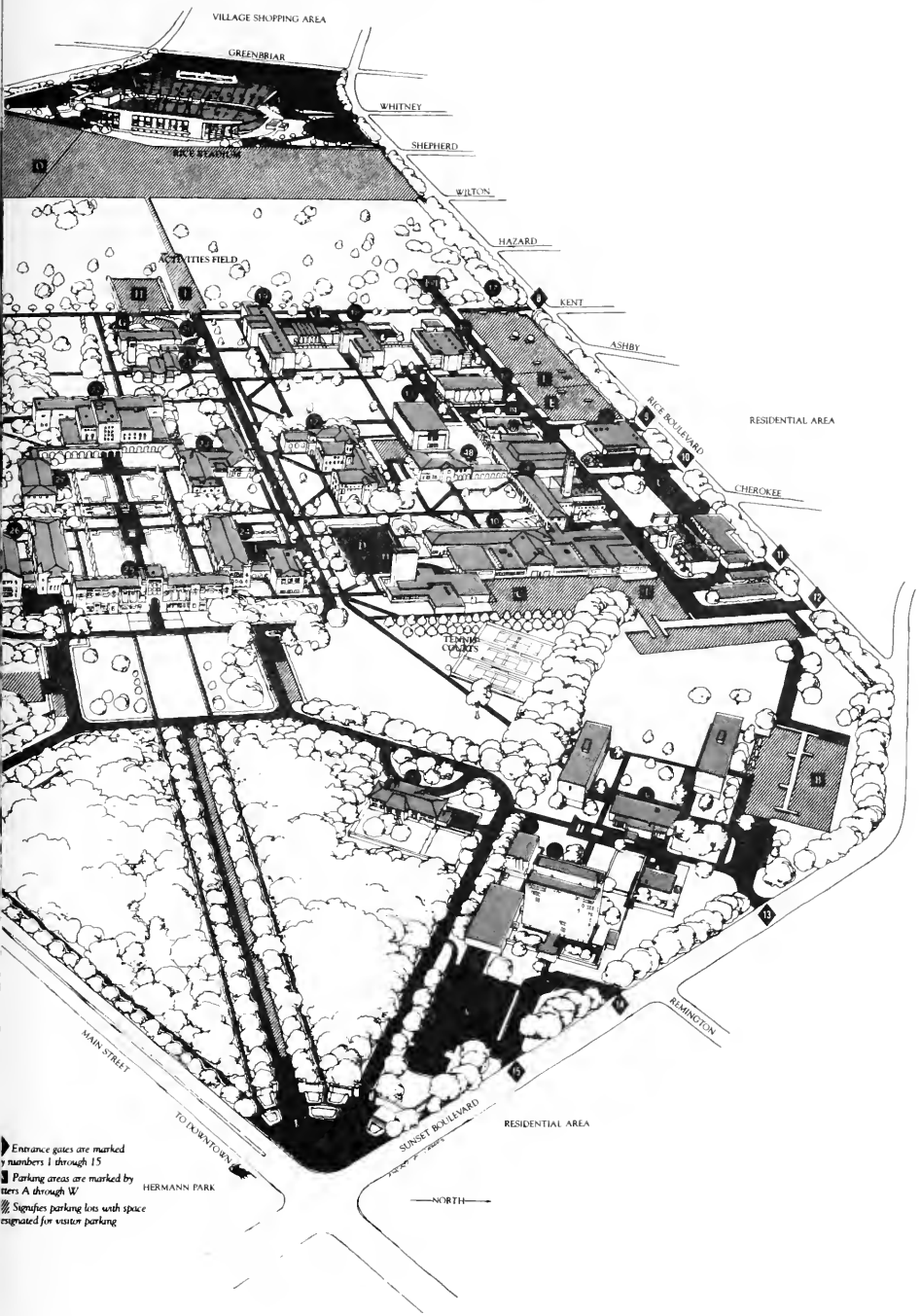
The Rice University Campus

Numerical listing of buildings:

1. President's House
2. Margarett Root Brown College
3. Brown House
4. Mary Gibbs Jones College
5. Jones House
6. Physical Plant Buildings
7. Central Kitchen/ROTC
8. Ryon Engineering Laboratory *(Engineering/ Materials Science)*
9. Mechanical Laboratory *(Engineering/Science)*
10. Abercrombie Engineering Laboratory
11. Bonner Nuclear Research Laboratory
12. Chemistry Building
13. Herman Brown Hall *(Math/Math Science)*
14. Mudd Building *(ICSA)*
15. Hamman Hall *(Auditorium)*
16. Space Science Building
17. Flammable Chemicals Storage Building
18. Keith-Wiess Geological Laboratories
19. Anderson Biological Laboratories
20. Rice Memorial Center *(Student activities/Pub/ Sammy's/Campus Store and Bookstore/Band Hall)*
21. Rice Chapel
22. Fondren Library *(History)*
23. Anderson Hall *(Architecture)*
24. Physics Laboratories
25. Lovett Hall *(Administrative offices/Admissions/Records/ Religious Studies/ Philosophy)*
26. Sewall Hall *(Art/Music/ Social Sciences/NROTC/ Education)*
27. Rayzor Hall *(English/ Foreign Languages/ Humanities/Linguistics)*
28. Herring Hall *(Jones Graduate School of Administration)*
29. Cohen House *(Faculty Club)*
30. Allen Center for Business Activities
31. James A. Baker College
32. Baker House
33. Wiess House
34. Harry C. Wiess College
35. Harry C. Hanszen College
36. Hanszen House
37. Will Rice College
38. Will Rice House
39. Edgar Odell Lovett College
40. Lovett House
41. Sid W. Richardson College
42. Richardson House
43. Rice Museum
44. Rice Media Center *(Photography)*
45. Gymnasium and Autry Court *(Health & PE/ Athletics)*
46. Owl Club Room, "R" Room
47. Rice Stadium
48. Mechanical Engineering
49. The Graduate House

Alphabetical listing of buildings:

Abercrombie Engineering Laboratory, 10
Allen Center for Business Activities, 30
Anderson Biological Laboratories, 19
Anderson Hall, 23
James A. Baker College, 31
Baker House, 32
Bonner Nuclear Research Laboratory, 11
Margarett Root Brown College, 2
Herman Brown Hall, 13
Brown House, 3
Central Kitchen/ROTC, 7
Chemistry Building, 12
Cohen House, 29
Flammable Chemicals Storage Building, 17
Fondren Library, 22
Graduate House (The), 49
Gymnasium and Autry Court, 45
Hamman Hall, 15
Harry C. Hanszen College, 35
Hanszen House, 36
Herring Hall, 28
Mary Gibbs Jones College, 4
Jones House, 5
Edgar Odell Lovett College, 39
Lovett Hall, 25
Lovett House, 40
Mechanical Engineering, 48
Mechanical Laboratory, 9
Mudd Building, 14
Owl Club Room, 46
Physical Plant Building, 6
Physics Laboratories, 24
President's House, 1
Rayzor Hall, 27
Rice Chapel, 21
Will Rice College, 37
Will Rice House, 38
Rice Media Center, 44
Rice Memorial Center, 20
Rice Museum, 43
Rice Stadium, 47
Sid W. Richardson College, 41
Richardson House, 42
Ryon Engineering Laboratory, 8
Sewall Hall, 26
Space Science Building, 16
Harry C. Wiess College, 34
Wiess House, 33


VILLAGE SHOPPING AREA
GREENBRIAR
WHITNEY
SHEPHERD
RICE STADIUM
WILTON
HAZARD
ACTIVITIES FIELD
KENT
ASHBY
RICE BOULEVARD
RESIDENTIAL AREA
CHEROKEE
TENNIS COURTS
MAIN STREET
TO DOWNTOWN
SUNSET BOULEVARD
REMINGTON
RESIDENTIAL AREA
HERMANN PARK
NORTH
Entrance gates are marked y numbers 1 through 15
Parking areas are marked by tters A through W
Signifies parking lots with space esignated for visitor parking

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Mr. Timothy L. Bratton
Mr. Joe Brazzatti
Mr. and Mrs. Benjamin E. Brewer, Jr.
Mr. and Mrs. Raymond D. Brochstein
Mr. and Mrs. Robert T. Brown
Mr. and Mrs. Jack B. Buckley
Mr. and Mrs. John D. Burns
Mr. and Mrs. James W. Carroll
Mr. and Mrs. Gregory P. Catsinas
Mr. and Mrs. Stephen C. Cook
Mr. Michael Cooper/Ms. Sandra L. Brunow
Mr. and Mrs. Joe Fred Crabb
Mr. and Mrs. André Crispin
Mr. and Mrs. Milton C. Cross
Mr. Robert J. Cruikshank
Mr. and Mrs. William E. Daniels
Mr. and Mrs. Edward J. Davis
Mr. and Mrs. Karl F. Doerner, Jr.
Mr. and Mrs. Melvin A. Dow
Mr. and Mrs. Walker J. Duffie
Mr. and Mrs. C. Richard Everett
Mr. and Mrs. Paul J. Evershade, Jr.
Mr. and Mrs. Paul Farren
Mr. and Mrs. Don E. Fizer
Mr. and Mrs. Larry D. Flournoy
Mr. and Mrs. Richard P. Ganchan
Mr. and Mrs. E. Ted Georges
Mr. and Mrs. David Kent Gibbs
Dr. and Mrs. Louis J. Girard
Mr. and Mrs. L. Henry Gissel, Jr.
Mr. and Mrs. Melbern G. Glasscock
Mr. E. Forbes Gordon
Mr. and Mrs. Matt Gorges
Dr. J. John Gugenheim
Mrs. John Hamman, Jr.
Mr. and Mrs. Ben C. Hayton
Mr. and Mrs. Alex W. Head
Mr. and Mrs. Neal B. Heaps
Mr. and Mrs. Dennis R. Hendrix
Mr. and Mrs. Robert M. Hermance
Mr. and Mrs. J. W. Hershey
Mr. and Mrs. B. B. Hollingsworth, Jr.
Mr. R. B. Hoover
Mr. and Mrs. Howard W. Horne
Mr. and Mrs. Guy W. Jackson, Jr.
Mr. and Mrs. John C. Jackson, Jr.
Mr. and Mrs. A. L. Jensen
Mr. and Mrs. Raleigh W. Johnson, Jr.
Mr. and Mrs. Robert K. Johnson
Mr. and Mrs. C. Daniel Jones
Dr. and Mrs. Charles F. Jones
Mr. and Mrs. T. Robert Jones
Mr. James L. Ketelsen
Mr. and Mrs. Henry H. King
Mr. and Mrs. William A. Kistler, Jr.
Mr. and Mrs. H. Fred Kongabel
Mr. and Mrs. Ronald C. Lassiter

Mr. and Mrs. J. Fred Lawrence
Mr. Hermon Lloyd
Mr. Ellie W. Long, Jr.
Mr. and Mrs. Daniel B. Lovejoy
Mr. and Mrs. H. Malcolm Lovett, Jr.
Dr. and Mrs. Fred R. Lummis, Jr.
Mr. James E. Lyon
Mr. and Mrs. Malcolm T. McCants
Mr. Joe A. McDermott, Jr.
Mr. and Mrs. Robert P. McFarland
Mr. and Mrs. Thomas S. McIntosh
Mr. and Mrs. Thomas L. McKittrick
Mr. and Mrs. Louis Macey
Mr. and Mrs. William S. Mackey, Jr.
Mr. and Mrs. William James Miller
Mr. and Mrs. Peder Monsen
Mr. and Mrs. Harvin C. Moore, Jr.
Mr. Stewart Morris, Jr.
Mr. and Mrs. W. Carloss Morris, Jr.
Mr. and Mrs. John G. Mott
Mr. and Mrs. Fred F. Murray
Mr. and Mrs. James K. Nance
Mr. and Mrs. Roy S. O'Connor
Mr. and Mrs. C. Michael O'Neal
Mr. and Mrs. Gwynne E. Old
Mr. and Mrs. George W. Oprea, Jr.
Mr. William P. Pannill
Mr. and Mrs. James L. Powell
Mr. and Mrs. Denton C. Priest, Sr.
Mr. and Mrs. Risher Randall
Mr. and Mrs. Harry M. Reasoner
Mr. and Mrs. John B. Reeder
Mr. and Mrs. John Gregory Reilly
Mr. and Mrs. Joseph F. Reilly, Jr.
Mr. and Mrs. Norman T. Reynolds
Mr. and Mrs. Hershel M. Rich
Mr. Morton L. Rich
Mr. George A. Robinson
Mr. and Mrs. Jim A. Robinson
Mrs. Evelyn Fink Rosenthal
Mr. and Mrs. Ellis Rudy
Mr. and Mrs. David M. Rulfs, Sr.
Miss Jane L. Rulfs
Dr. and Mrs. George Rupp
Mr. and Mrs. Patric Savage
Mr. and Mrs. Gus A. Schill, Jr.
Mr. and Mrs. Steve J. Shaper
Mr. and Mrs. Frank C. Shelden
Mr. and Mrs. William Shiffick
Mr. and Mrs. Ted G. Shown
Dr. and Mrs. Howard M. Siegler
Mr. and Mrs. David M. Smith
Mrs. Lorena Steakley
Mr. and Mrs. Dan C. Steiner
Mr. and Mrs. Herbert L. Stone
Dr. and Mrs. John R. Strawn
Mr. and Mrs. Hugh W. Thompson III
Mr. and Mrs. John Z. Tomich
Mr. and Mrs. Jack A. Turpin
Mr. and Mrs. Ame Vennema
Mr. James T. Wagoner
Mr. and Mrs. James V. Walzel
Mr. and Mrs. Louis A. Waters
Mr. James A. Whitson, Jr.
Dr. and Mrs. Charles W. Yates, Jr.
Mr. and Mrs. John Glenn Yeager
Mr. and Mrs. Frank E. Zumwalt, Jr.

Instructional and Research Staff

Emeritus Faculty

Austin, Walter J., 1960-87. Professor Emeritus of Civil Engineering
B.S.C.E. (1941) Rice Institute; M.S. (1946), Ph.D. (1949) University of Illinois

Awapara, Jorge, 1957-94. Professor Emeritus of Biochemistry
B.S. (1941), M.S. (1942) Michigan State University; Ph.D. (1947) University of Southern California

Bale, Allen M., 21947-78. Athletic Director Emeritus
B.S. (1930) Rice Institute; M.A. (1939) Columbia University

Barker, J.R., 1949-86. Professor Emeritus of Health and Physical Education
B.S. (1949) Rice Institute; M.Ed. (1954) University of Texas

Beckmann, Herbert W.K., 1957-85. Professor Emeritus of Mechanical Engineering
Cand. Ing. (1939), Dipl. Ing. (1944), Dr. Ing. (1957), Hanover University, Germany

Bourgeois, Andre Marie Georges, 1928-72. Favrot Professor of French
Bachelier en lettres (1921), Bachelier en Droit (1923), Certifie d'etudes superieuries de lettres (1930) University of Paris, France; M.A. (1934) University of Texas; Docteur de l'luniversite (1945) University of Paris, France; Commandeur de l'Ordre des Palmes Academiques (1971)

Brotzen, Franz Richard, 1954-86. Stanley C. Moore Professor Emeritus of Materials Science
B.S. (1950), M.S. (1953), Ph.D. (1954) Case Institute of Technology

Bryan, Andrew Bonnell, 1957-68. Lecturer Emeritus in Physics
B.A. (1918), M.A. (1920), Ph.D. (1922) Rice Institute

Camden, Carroll, 1930-73. Professor Emeritus of English and Honorary Charter Associate of Hanszen College
A.B. (1925) Centre College; Ph.D. (1930) University of Iowa

Cason, Carolyn, 1956-74. Lecturer Emeritus in Dietetics
B.S. (1934) University of Texas; M.A. (1939) Columbia University

Class, Calvin M., 1952-85. Professor Emeritus of Physics
A.B. (1943), Ph.D. (1951) Johns Hopkins University

Curtis, Morton L., 1964-87. W.L. Moody, Jr. Professor Emeritus of Mathematics
B.S. (1943) Texas A&I University; Ph.D. (1951) University of Michigan

Dowden, Wilfred Sellers, 1948-87. Professor Emeritus of English and Honorary Associate of Baker College
B.A. (1939), M.A. (1940) Vanderbilt University; Ph.D. (1949) University of North Carolina

Evans, Elinor Lucile, 1964-85. Albert K. and Harry W. Smith Professor Emeritus of Architecture
B.A. (1938) Oklahoma State University; M.F.A. (1954) Yale University

Fulton, James Street, 1946-74. Professor Emeritus of Philosophy and Honorary Master of Will Rice College
B.A. (1925), M.A. (1929) Vanderbilt University; Ph.D. (1934) Cornell University

Gordon, William E., 1955-85, Distinguished Professor Emeritus of Space Physics and Astronomy and of Electrical and Computer Engineering
B.A. (1939), M.A. (1942) Montclair State College; M.S. (1946), Ph.D. (1953) Cornell University

Hackerman, Norman, 1970-85, President Emeritus and Distinguished Professor Emeritus of Chemistry
A.B. (1932), Ph.D. (1935) Johns Hopkins University

Hake, Evelyn, 1932-74, Lecturer Emeritus in Biology
B.A. (1930), M.A. (1932) Rice Institute

Hale, Elton B., 1963-79. Professor Emeritus of Accounting
B.S. (1937), M.A. (1940) Southwest Texas State Teachers College; Ph.D. (1948) University of Texas

Hartsook, Arthur J., 1921-61. Professor Emeritus of Chemical Engineering
A.B. (1911) Nebraska Weslayan University; B.S.Ch.E. (1920), M.S. (1921) Massachusetts Institute of Technology

Higginbotham, Sanford Wilson, 1961-83. Professor Emeritus of History
B.A. (1934) Rice Institute; M.A. (1941) Louisiana State University; Ph.D. (1949) University of Pennsylvania

Hodges, Lee, 1930-71. Professor Emeritus of French
B.S. (1930) Harvard University; M.A. (1934) Rice Institute

Jitcoff, Andrew N., 1950-72. Professor Emeritus of Russian
Bachelor (1928), Master (1931) Prague Institute of Technology, Czechoslavia

Kilpatrick, John E., 1947-85. Professor Emeritus of Chemistry and of Mathematical Sciences
B.A. (1940) Stephen F. Austin State University; A.M. (1942) University of Kansas; Ph.D. (1945) University of California, Berkeley

Krzyzaniak, Marian, 1964-81. Professor Emeritus of Economics
B.A. (1932) University of Poznan, Poland; M.A. (1954) University of Alberta, Canada; Ph.D. (1959) Massachusetts Institute of Technology

Lecuyer, Maurice Antoine, 1962-79. Professor of French
Baccalaureat es lettres (1937), Licence es lettres (1943), Diplome d'etudes superieures (1944) Universite de Paris, France; Ph.D. (1954) Yale University

Manschreck, Clyde L., 1983-86. Harry and Hazel Chavanne Professor Emeritus of Religious Studies
B.A. (1941) George Washington University; B.D. (1944) Garrett Evangelical Seminary; M.A. (1944) Northwestern University; Ph.D. (1948) Yale University

Morehead, James Caddell, Jrs. 1940-79. Professor Emeritus of Architecture and Honorary Associate of Baker College
A.B. (1935) Princeton University; B.Arch. (1939) Carnegie Institute of Technology

Nettleton, Lewis L., 1971-76. Lecturer Emeritus in Geology
B.S. (1918) University of Idaho; M.S. (1921), Ph.D. (1923) University of Wisconsin

Norbeck, Edward, 1960-81. Professor Emeritus of Anthropology
B.A. (1948), M.A. (1949), Ph.D. (1952) University of Michigan

Oliver, Covey., 1979-81. Radoslav A. Tsanoff Professor Emeritus of Public Affairs
B.A. (1933), J.D. (1936) University of Texas; LL.M. (1953), S.J.D. (1954) Columbia University; LL.D. (1976) Southern Methodist University

Oliver-Smith, Philip, 1969-82. Professor Emeritus of Art History
B.A. (1937), M.A. (1950) University of California, Berkeley; Ph.D. (1969) New York University

Parsons, David G., 1953-81. Professor Emeritus of Art and Honorary Associate of Will Rice College
B.S. (1934), M.S. (1937) University of Wisconsin

Rachford, Henry H., Jr., 1964-82. Professor Emeritus of Mathematical Sciences
B.S. (1945), M.A. (1947) Rice Institute; Sc.D. (1950) Massachusetts Institute of Technology

Ransom, Harry Steelsmith, Jr., 1954-81. Professor Emeritus of Architecture
B.Arch. (1947 Carnegie Institute of Technology; M.Arch. (1967) Texas A&M University

Rath, R. John, 1963-80. Professor Emeritus of History
A.B. (1932) Kansas; M.A. (1934) Berkeley; Ph.D. (1941) Columbia University

Richter, George H., 1931-74. Professor Emeritus of Chemistry
B.A. (1926), M.A. (1927), Ph.D. (1929) Rice Institute

Risser, J.R., 1946-81. Professor Emeritus of Physics
A.B. (1931) Franklin and Marshall College; M.A. (1935), Ph.D. (1938) Princeton University

Rossini, Frederick D., 1971-75. Professor Emeritus of Chemistry
B.S. (1925), M.S. (1926) Carnegie Institute; Ph.D. (1928) University of California, Berkeley

Shelton, Fred Vernon, 1927-71. Professor Emeritus of French and Honorary Charter Associate of Hanszen College

B.A. (1926), M.A. (1928) Rice Institute; M.A. (1942) University of Mexico; Docteur de l'universite (1963) University of Paris, France

Sims, James R., 1942-87. Herman and George Brown Professor Emeritus of Civil Engineering

B.S. (1972) Georgia Institute of Technology; Ph.D. (1976) University of North Carolina, Chapel Hill

Spears, Monroe Kirk, 1964-86. Libbie Shearn Moody Professor Emeritus of English

A.B., A.M. (1937) University of South Carolina; Ph.D. (1940) Princeton University

Storck, Roger L., 1966-85. Professor Emeritus of Biology

B.S. (1945), M.S. (1946) Institute Fermentations-Meurice Chimie, Belgium; Ph.D. (1960) University of Illinois

Thomas, Joe David, 1930-77. Professor Emeritus of English

Ph.B. (1929), A.M. (1930) University of Chicago

Thrall, Robert, 1969-84. Noah Harding Professor Emeritus of Mathematical Sciences and Professor Emeritus of Administrative Science

Tipton, Albert N., 1975-87. Professor Emeritus of Music

Artists Diploma (1939) Curtis Institute; B.M. (1952) Washington University; M.M. (1953) St. Louis Institute of Music

Topazio, Virgil William, 1965-83. Laurence H. Favrot Professor of French

B.A. (1943) Weslayan College; M.A. (1947), Ph.D. (1951) Columbia University

Wadsworth, Philip A., 1964-73. Professor Emeritus of French

A.B. (1935), Ph.D. (1939) Yale University

Wall, Frederick T., 1972-79. Professor Emeritus of Chemistry

B.C. (1933), Ph.D. (1937) University of Minnesota

Wann, T.W., 1962-79. Professor Emeritus of Psychology

B.A. (1937), Ph.D. (1949) University of California, Berkeley

Wilhoit, James Cammack, Jr., 1954-81. Professor Emeritus of Mechanical Engineering and Mathematical Sciences

B.S.M.E. (1948) Rice Institute; M.S. (1951) Texas A&M University; Ph.D. (1954) Stanford University

Williams, George Guion, 1924-68. Professor Emeritus of English

B.A. (1923), M.A. (1925) Rice Institute

Instructional and Research Staff

Aazhang, Behnaam, 1985. Assistant Professor of Electrical and Computer Engineering and Associate of Lovett College

B.S. (1981), M.S. (1983), Ph.D. (1986) University of Illinois

Adair, Linda S., 1980. Associate Professor of Anthropology and Associate of Baker College

B.A. (1971) State University of New York, Stony Brook; Ph.D. (1980) University of Pennsylvania

Adams, John Allan Stewart, 1954. Professor of Geochemistry

Ph.B.(1946), B.S. (1948), M.S. (1949), Ph.D. (1951) University of Chicago

Addison, Anthony, 1984. Artist Teacher of Opera, Director of Opera

Akers, William Walter, 1947. Professor in the Department of Chemical Engineering and Vice President for Administration

B.S. (1943) Texas Technological College; M.S. (1944) University of Texas; Ph.D. (1950) University of Michigan

Akin, John Edward, 1983. Professor of Mechanical Engineering and Mathematical Sciences

B.S. (1964) Tennessee Polytechnic Institute; M.S. (1966) Tennessee Technological University; Ph.D. (1968) Virginia Polytechnic Institute

Alcover, Madeleine, 1975. Professor of French

Licence de lettres moderne (1962), Diplome de'etudes superieures (1963), Doctorat de 3' cycle (1965) France

Alford, John, 1985. Associate Professor of Political Sciences

B.S. (1975), M.A. (1977) Univ. of Houston; M.A. (1980), Ph.D. (1981) University of Iowa

Alfrey, Clarence P., Jr., 1968. Adjunct Professor in the Biomedical Engineering Laboratory

B.A. (1951) Rice Institute; M.D. (1955) Baylor College of Medicine; Ph.D. (1966) University of Minnesota

Almes, Guy T., 1985. Assistant Professor of Computer Science

B.A. (1972), M.E.E. (1972) Rice University; Ph.D. (1980) Carnegie-Mellon University

Ambler, John S., 1964. Professor of Political Science and Associate of Brown College

B.A. (1953) Willamette University; M.A. (1954) Stanford University; Certificat d'etudes politiques (1955) University of Bordeaux, France; Ph.D. (1966) University of California, Berkeley

Anderson, Craig A., 1980. Associate Professor of Psychology and Associate of Hanszen College

B.A. (1976) Butler University; M.A. (1978), Ph.D. (1980) Stanford University

Anderson, James E., 1983. Visiting Professor of Political Science

B.S. (1955) Southwest Texas State University; Ph.D. (1959) University of Texas

Anderson, John B., 1975. Professor of Geology and Geophysics

B.S. (1968) University of South Alabama; M.S. (1970) University of New Mexico; Ph.D. (1972) Florida State University

Andrews, John F., 1982. Professor of Environmental Science and Engineering

B.S.C.E. (1951), M.S. (1954) University of Arkansas; Ph.D. (1964) University of California, Berkeley

Angel, Yves C., 1984. Assistant Professor of Mechanical Engineering and Associate of Brown College

B.S. (1976) Ecole Centrale De Lyon, France; M.S. (1977), Ph.D. (1980) University of California, Berkeley

Antoulas, Athanasios C., 1985. Associate Professor of Electrical and Computer Engineering and Associate of Sid Richardson College

Dip. in Electrical Engineering (1975), Dip. in Mathematics (1975) Ph.D. (1980) ETH Zurich

Apple, Max I., 1971. Gladys Louise Fox Professor of English

B.A. (1963) University of Michigan; M.A. (1965) Stanford University; Ph.D. (1970) University of Michigan

Arad, Atar, 1987. Professor of Viola in the Shepherd School of Music

Artist Diploma (1966) The Israely Academy of Music; Diploma (1971) Chapelle Musicale de la Reine Elisabeth, Brussels; Diploma Superieur (1972) Brussels Conservatory.

Arbiter, Eric A., 1977. Assistant Professor of Music

B.M.E. (1972) Oberlin Conservatory of Music; M.Mus. (1973) Cleveland Institute of Music

Aresu, Bernard, 1977. Associate Professor of French and Master of Brown College

Licence es lettres (1967) Université de Montpellier, France; Ph.D. (1975) University of Washington

Armeniades, Constantine D., 1969. Professor in the Department of Chemical Engineering and Associate of Will Rice College

B.S. (1961) Northeastern University; M.S. (1967) Case Institute of Technology; Ph.D. (1969) Case Western Reserve University

Atherholt, Robert, 1984. Artist Teacher, Oboe

B.Mus. (1976), M.Mus. (1977) Juilliard School of Music

Atkinson, E. Neely, 1985. Adjunct Assistant Professor of Statistics

B.A. (1975), M.A., Ph.D. (1981) Rice University

Austin, Joe Dan, 1978. Associate Professor of Education and Mathematical Sciences and Associate of Jones College

B.S. in Applied Mathematics (1966) Georgia Institute of Technology; M.S. in Mathematical Statistics (1968), Ph.D. in Mathematics Education (1972) Purdue University

Avé Lallemant, Hans G., 1970. Professor of Geology and Geophysics

B.Sc. (1960), M.Sc. (1964), Ph.D. (1967) Leiden University, Netherlands

Babikian, Virginia, 1982. Professor of Voice

B.Mus. (1951), M.Mus. (1952) Westminster Choir College; Artist's Diploma (1957), Diploma (1956) Universita per stranieri, Perugia, Italy

Bacon, Thomas, 1987. Artist Teacher, Horn

B.S. (1975) Oakland University

Bailar, Benjamin F., 1987. Dean of Jesse H. Jones Graduate School of Administration and Professor of Administration

B.A. (1955) University of Colorado; M.B.A. (1959) Harvard Graduate School of Business Administration

Bailey, Toby N., 1985. Assistant Professor of Mathematics

M.A. (1981) Cambridge University, England; Ph.D. (1982) Oxford University, England

Bailey, Walter B, 1982. Assistant Professor of Music

B.Mus. (1976) Lewis and Clark College; M.A. (1979), Ph.D. (1982) University of Southern California

Baker, Donald Roy, 1966. Professor of Geology and Geophysics and Honorary Associate of Brown College

B.S. (1950) California Institute of Technology; Ph.D. (1955) Princeton University

Baker, Lovett, 1986. Lecturer on Administrative Science

A.B. (1952) Princeton University

Baker, Stephen D., 1963. Professor of Physics and Honorary Associate of Hanszen College

B.S. (1957) Duke University; M.S. (1959), Ph.D. (1963) Yale University

Bally, Albert W., 1981. Harry Carothers Wiess Professor of Geology

Ph.D. (1953) University of Zurich, Switzerland

Barlow, Grant H., 1986. Adjunct Professor in the Biomedical Engineering Laboratory

B.S. (1949) Wilkes College; Ph.D. (1953) Catholic University

Barnes, Mary W., 1983. Assistant Professor of Art and Associate of Lovett College

B.F.A. (1971) Drake University; M.F.A. (1976) University of Arizona

Barry, David, 1987. Lecturer on German

B.A. (1977) Pembroke College; M.A. (1978), Ph.D. (1983) Queen's University, Canada

Batsell, Richard R., 1980. Associate Professor of Administrative Science and Associate of Hanszen College

B.A., B.B.A. (1971), Ph.D. (1976)University of Texas

Bavinger, Bill Allen, 1977. Assistant Professor of Architecture
B.A. (1973), M.Arch. (1976) Rice University

Bayazitoglu, Yildiz, 1977. Associate Professor of Mechanical Engineering
B.S. (1967) Middle East Technological University; M.S. (1969), Ph.D. (1974) University of Michigan

Bearden, Frank W., 1954. Professor of Human Performance and Health Sciences
B.S. (1947) Texas Technological College; M.A. (1949), Ed.D. (1954) Columbia University

Beckingham, Kathleen, 1980. Associate Professor of Biochemistry
B.A. (1967), Ph.D. (1972) Cambridge University, England

Bedient, Philip B., 1975. Professor of Environmental Science and Engineering
B.S. (1969), M.S. (1972), Ph.D. (1975) University of Florida

Bell, Philip W., 1978. William Alexander Kirkland Professor of Administrative Science and Associate of Lovett College
B.A. (1947) Princeton University; M.A. (1949) University of California, Berkeley; Ph.D. (1954) Princeton University

Benjamin, Don C., Jr., 1978. Lecturer in Religious Studies and Associate of Sid Richardson College
B.A. (1964) St. Bonaventure University; M.A. (1968) Catholic University of America; Ph.D. (1981) Claremont Graduate School

Benjamin, Robert C. A., 1986. Adjunct Assistant Professor of Administrative Science
B.S. (1974) Instituto Technologico y de Estudios Superiores de Monterey, Mexico; M.B.A. (1976) University of Texas

Bennett, George N., 1978. Associate Professor of Biochemistry and Associate of Lovett College
B.S. (1968) University of Nebraska; Ph.D. (1974) Purdue University

Berget, Susan M., 1978. Adjunct Associate Professor of Biochemistry
B.S. (1969), M.S. (1971) Southern Illinois University; Ph.D. (1974) University of Minnesota

Berry, Michael J., 1980. Robert A. Welch Professor of Chemistry
B.S. (1967) University of Michigan; Ph.D. (1970) University of California, Berkeley

Bible, Frances L.,1975. Artist in Residence, Voice
Artists Diploma in Singing (1942), Graduate Diploma in Voice (1947) Juilliard School of Music

Bickers, Kenneth N., 1987 Assistant Professor of Political Science
B.A. (1981) Texas Christian University; M.A. (1983) University of Wisconsin-Madison

Biesele, Marguerite A., 1980. Assistant Professor of Anthropology
B.A. (1967) University of Michigan; M.A. (1968), Ph.D. (1975) Harvard University

Billups, W. Edward, 1970. Professor of Chemistry
B.S. (1961), M.S. (1965) Marshall University; Ph.D. (1970) Pennsylvania State University

Birdwell, Al E., 1986. Lecturer on Administrative Science
B.B.A. (1959), M.B.A. (1960), Ph.D. (1964) University of Texas at Austin

Bixby, Robert E., 1984. Professor of Mathematical Sciences and Administrative Science
B.S. (1968) University of California; M.S. (1971), Ph.D. (1972) Cornell University

Blackburn, James B.,1975. Lecturer on Architecture and Environmental Science
B.A. (1969), J.D. (1972) University of Texas; M.S. (1974) Rice University

Bland, Robert L., 1954. Associate Professor of Human Performance and Health Sciences
Central Washington State College; M.A. (1954) Columbia University

Blumberg, Mitchell, 1981. Adjunct Professor of Administrative Science
A.B. (1965), J.D. (1968) University of Pennsylvania; M.B.A. (1973) Harvard University

Boehm, Hans-Juergen, 1985. Assistant Professor of Computer Science
B.S. (1978) University of Washington; M.S. (1980), Ph.D. (1984) Cornell University

Boles, John B., 1981. Professor of History and Associate of Will Rice College
B.A. (1965) Rice University; Ph.D. (1969) University of Virginia

Bonner, Billy E., 1985. Professor of Physics and Director of T. W. Bonner Nuclear Laboratories
B.S. (1961) Louisiana Polytechnic Institute; M.A. (1963), Ph.D. (1965) Rice University

Bordelon, Cassius B., Jr., 1972. Lecturer on Human Performance and Health Sciences Physical Education

B.S. (1964) Louisiana State University; Ph.D. (1972) Baylor College of Medicine

Boshernitzan, Michael, 1982. Associate Professor of Mathematics

B.A. (1971) Moscow University, U.S.S.R.; M.A. (1974) Hebrew University, Israel; Ph.D. (1981) Weizmann Institute of Science, Israel

Boterf, Chester Arthur, 1973. Associate Professor of Art

B.A. (1959) Kansas University; M.F.A. (1965) Columbia University

Bourland, Hardy. M., 1961. Lecturer in Electrical and Computer Engineering, Director of Rice Engineering Design and Development Institute, and Assistant Dean of Engineering for Student Development

B.S. (1955) Texas Technological College; S.M.E.E. (1957) Massachusetts Institute of Technology

Boyd, E. Andrew, 1987. Assistant Professor of Mathematical Sciences

A.B. (1981) Oberlin College; Ph.D. (1987) Massachusetts Institute of Technology

Boyd, Harold B., 1979. Adjunct Professor in the Department of Chemical Engineering

B.A. (1959) Drexel University; M.Ch.E. (1962) New York University

Brady, Patrick, 1972. Lawrence H. Favrot Professor of French

B.A. (1956) University of Sydney, Australia; Doctorat de l'Universite (1960) Sorbonne, France

Brelsford, John W., Jr., 1970. Professor of Psychology and Associate of Will Rice College

B.A. (1960), M.A. (1961) Texas Christian University; Ph.D. (1965) University of Texas

Bridges, Eileen, 1987. Assistant Professor of Administrative Science

B.S. (1977) California Institute of Technology; M.E.E. (1978) Rice University; M.B.A. (1982) University of Santa Clara; Ph.D. (1987) Northwestern University

Briggs, Fayé, 1982. Associate Professor of Computer Science in the Department of Electrical and Computer Engineering and Associate of Baker College

B.S.E.E. (1971) Ahmedu Bello University, Nigeria; M.A. (1974) Stanford University; Ph.D. (1977) University of Illinois

Brito, Dagobert L. 1984. George A. Peterkin Professor of Political Economy

B.A. (1967), M.A. (1970), Ph.D. (1970) Rice University

Brody, Baruch, 1975. Professor of Philosophy

B.A. (1962) Brooklyn College; M.A. (1965), Ph.D. (1967) Princeton University

Broker, Karin L., 1980. Associate Professor of Art and Associate of Lovett College

B.F.A. (1972) University of Iowa; M.F.A. (1980) University of Wisconsin

Brooks, Philip R., 1964. Professor of Chemistry and Associate of Lovett College

B.S. (1960) California Institute of Technology; Ph.D. (1964) University of California, Berkeley

Brooks, Wayne, 1985. Artist Teacher, Viola

Diploma (1977) Curtis Institute of Music

Brosch, Gary L., 1987. Adjunct Assistant Professor of Administrative Science

B.S. (1971) University of South Florida; M.S. (1973) Florida State University

Brown, Arthur M., 1985. Adjunct Professor of Biology

M.D. (1956) University of Manitoba, Canada; Ph.D. (1964) University of London, England

Brown, Barry W., 1970. Adjunct Professor of Statistics

B.S.(1959) University of Chicago; M.S. (1961), Ph.D. (1963) University of California, Berkeley

Brown, Bryan W., 1983. Associate Professor of Economics and Mathematical Sciences

B.A. (1969), M.A. (1972) Texas Tech University; Ph.D. (1977) University of Pennsylvania

Brown, Katherine Tsanoff, 1963. Professor of Art History and Honorary Associate of Will Rice College

B.A. (1938) Rice Institute; M.F.A. (1940) Cornell University

Brown, Peter Thomson, 1978. Assistant Professor of Art and Art History and Associate of Brown College

B.A. (1971), M.F.A. (1977) Stanford University

Brown, Richard, 1984. Assistant Professor of Percussion

B.M.E. (1969) Temple University; M.Mus. (1971) Catholic University of America

Bryan, William J., 1982. Adjunct Professor of Human Performance and Health Sciences
B.A. (1971) Johns Hopkins University; M.D. (1975) Baylor College of Medicine

Bryant, John, 1981. Henry S. Fox Sr. Professor of Economics, Professor of Administrative Science and Associate of Wiess College
B.A. (1969) Oberlin College; M.S. (1973), Ph.D. (1975) Carnegie-Mellon University

Bryant, Robert L., 1979. Noah Harding Professor of Mathematics and Resident Associate of Lovett College
B.S. (1974) North Carolina State University; Ph.D. (1979) University of North Carolina

Buchholz, Rogene A., 1987. Visiting Lynette S. Autrey Professor of Business Ethics in the Jones Graduate School
B.S. (1959) North Central College; M.S. (1960) University of Illinois; B.D. (1964) Southern Methodist University; Ph.D. (1974) University of Pittsburgh

Buffler, Richard T., 1984. Adjunct Professor of Geology and Geophysics
B.S. (1959) University of Texas; Ph.D. (1967) University of California, Berkeley

Burgess, Kevin, 1986. Assistant Professor of Chemistry
B.Sc. (1979) University of Bath, England; M.Sc. (1980) University of East Anglia, England; Ph.D. (1983) University of Cambridge, England

Burke, Kevin, C. A., 1983. Adjunct Professor of Geology and Geophysics
B.Sc. (1951), Ph.D. (1953) University of London, England

Burnett, Sarah A., 1972. Associate Professor of Psychology and Associate of Jones College
B.S. (1966) Memphis State University; M.S. (1970), Ph.D. (1972) Tulane University

Burnside, Mary A., 1986. Adjunct Assistant Professor of Psychology
B.A. (1972) Rice University; M.A. (1976), Ph.D. (1980) University of Houston

Burrus, C. Sidney, 1965. Professor of Electrical and Computer Engineering, Honorary Associate of Will Rice College and Associate of Lovett College
B.A., B.S.E.E. (1958) Rice Institute; M.S. (1960) Rice University; Ph.D. (1965) Stanford University

Burt, George, 1985. Associate Professor of Theory and Composition
B.A. (1955) University of California, Berkeley; M.A. (1958) Mills College M.F.A. (1962) Princeton University

Butler, James E., 1982. Adjunct Professor of Human Performance and Health Sciences
B.S. (1956) University of the South; M.A. (1957) Southwest Texas State College; M.D. (1962) University of Texas Medical Branch, Galveston

Caballero, William, 1985. Artist Teacher, Horn
B.Mus. (1982) New England Conservatory of Music

Caflisch, Anna B., 1983. Lecturer on Italian
Liceo Classico J. Stellini, Udine, Italy; Ph.D. (1958) University of the Sacred Heart, Milan, Italy

Camfield, William A., 1969. Joseph and Joanna Nazro Mullen Professor of Art History
A.B. (1957) Princeton University; M.A. (1961), Ph.D. (1964) Yale University

Campbell, James Wayne, 1959. Professor of Biology
B.S. (1953) Southwest Missouri State University; M.S. (1955) University of Illinois; Ph.D. (1958) University of Oklahoma

Cannady, William Tillman, 1964. Professor of Architecture
B.Arch. (1961) University of California, Berkeley; M.Arch. (1962) Harvard University

Cardus, David, 1970. Adjunct Professor of Statistics
B.A., B.Sc. (1942) University of Montpellier, France; M.D. (1949) Barcelona Medical School, Spain

Carnahan, Norman F., 1986. Lecturer on Chemical Engineering
B.SChE (1965) Univ. of Houston; Ph.D. (1971) University of Oklahoma.

Carrington, Samuel M., Jr., 1967. Professor of French, University Librarian, and University Associate of Jones College.
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina

Cartwright, Robert S., Jr., 1980. Professor of Computer Science and Associate of Hanszen College

B.A. (1971) Harvard College, M.A. (1973), Ph.D. (1973) Stanford University

Casbarian, John Joseph, 1973. Professor of Architecture

B.A. (1969) Rice University, M.F.A. (1971) California Institute of the Arts, B.Arch. (1972) Rice University

Castaneda, James A., 1961. Professor of Spanish and Honorary Master of Will Rice College and Golf Coach

B.A. (1954) Drew University, M.A. (1955), Ph.D. (1958) Yale University

Chae, Suchan, 1985. Assistant Professor of Economics

B.S. (1978) Seoul National University; M.S. (1980) Jeonbuk National University; Ph.D. (1985) University of Pennsylvania

Chaisson, William, 1983. Artist Teacher of Music, Piano

B.Mus. (1952) Houston Conservatory of Music

Chamberlain, Joseph W., 1971. Professor of Space Physics and Astronomy

A.B. (1948), A.M. (1949) University of Missouri; M.S. (1951), Ph.D. (1952) University of Michigan

Chance, Jane, 1973. Professor of English and Associate of Will Rice College

B.A. (1967) Purdue University; M.A. (1968), Ph.D. (1971) University of Illinois

Chang, Donald C., 1970. Adjunct Assistant Professor of Biophysics in the Department of Physics

B.S. (1965) National Taiwan University; M.A. (1967), Ph.D. (1970) Rice University

Chapman, Alan Jesse, 1946. Harry S. Cameron Professor of Mechanical Engineering

B.S.M.E. (1945) Rice Institute; M.S. (1949) University of Colorado; Ph.D. (1953) University of Illinois

Cheatham, John Bane, Jr., 1963. Professor of Mechanical Engineering

B.S. (1948), M.S. (1953) Southern Methodist University; Ph.D. (1960) Rice University

Chen, Lilly C.H., 1981. Instructor in Linguistics and Semiotics

B.A. (1961) National Taiwan University; M.A. (1969), Ph.D. (1974) University of Illinois

Chiu, Shean-Tsong, 1984. Assistant Professor of Statistics

B.S. (1977) National Tsing-Hua University, Hisuchu, Taiwan; M.A. (1981), Ph.D. (1984) University of California, Berkeley

Chow, Bennett, 1987. Visiting Instructor of Mathematics

B.S. (1981) University of Wisconsin; Ph.D. (1986) Princeton University

Citron, Marcia J., 1976. Associate Professor of Music and Associate of Brown College

B.A. (1966) Brooklyn College; M.A. (1970), Ph.D. (1971) University of North Carolina

Ciufolini, Marco A., 1984. Assistant Professor of Chemistry

B.S. (1978) Spring Hill College; Ph.D. (1981) University of Michigan

Clark, Howard Charles, 1966. Associate Professor of Geology and Geophysics and Associate of Baker College

B.S. (1959) University of Oklahoma; M.A. (1965), Ph.D. (1967) Stanford University

Clark, John W., Jr., 1968. Professor in the Department of Electrical and Computer Engineering

B.S. (1962) Christian Brothers College; M.S. (1965), Ph.D. (1967) Case Western Reserve University

Clark, Susan L., 1973. Professor of German and Associate of Baker College

B.A. (1969) Mount Union College; M.Phil. (1972), Ph.D. (1973) Rutgers University

Clayton, Donald D., 1963. Andrew Hays Buchanan Professor of Astrophysics in the Departments of Space Physics and Astronomy and of Physics and Associate of Will Rice College

B.S. (1956) Southern Methodist University; M.S. (1959), Ph.D. (1962) California Institute of Technology

Cloutier, Paul A., 1967. Professor of Space Physics and Astronomy

B.S. (1964) University of Southwestern Louisiana; Ph.D. (1967) Rice University

Cohen, Ruben D., 1985. Assistant Professor of Mechanical Engineering
B.M.E. (1978) Concordia University, Montreal; M.S.M.E. (1979) University of Massachusetts, Amherst; Ph.D. (1985) Massachusetts Institute of Technology

Colaco, Joseph P., 1975. Lecturer on Architecture
B.S. (1960) University of Bombay, India; M.S. (1962), Ph.D. (1965) University of Illinois

Comissiona, Sergiu, Artist in Residence, Conducting

Connelly, Brian, 1984. Artist Teacher, Piano Accompaniment and Vocal Coach
B.Mus. (1980), M.Mus. (1983) University of Michigan

Cooke, Nancy M., 1987. Assistant Professor of Psychology
B.A. (1981) George Mason University; M.A. (1983) Ph.D. (1987) New Mexico State University

Cooper, Bruce F., 1986. Lecturer on Biochemistry
B.A. (1978) Kent State; Ph.D. (1985) Rice University

Cooper, Joseph, 1967. Herbert S. Autrey Professor of Social Sciences, Professor of Administrative Science and Dean of the School of Social Sciences
A.B. (1955), M.A. (1959), Ph.D. (1961) Harvard University

Cooper, Paul, 1974. Lynette S. Autrey Professor in Music and Composer-in-Residence
B.Mus., B.A. (1950), M.A. (1953), D.M.A. (1956) University of Southern California

Copeland, James E., 1966. Professor of Linguistics and Semiotics and Associate of Baker College
B.A. (1961) University of Colorado; Ph.D. (1965) Cornell University

Corcoran, Marjorie D., 1980. Associate Professor of Physics and Associate of Baker College
B.S. (1972) University of Dayton; Ph.D. (1977) Indiana University

Crowell, Steven G., 1983. Assistant Professor of Philosophy
A.B. (1974) University of California, Santa Cruz; M.A. (1976) Northern Illinois University; Ph.D. (1981) Yale University

Cunningham, Kevin F., 1982. Adjunct Professor of Administrative Science
A.B. (1960) Duke University; M.B.A. (1966) Columbia University; J.D. (1972) Yale University

Cunningham, Robert A., 1986. Lecturer in Mechanical Engineering and Materials Science
A.A. (1943) Schriner Institute; B.S.M.E. (1949), M.S.M.E. (1955) Rice Institute

Cunningham, R. George, 1979. Lecturer on Architecture
B.S. (1952) University of Texas

Curl, Robert F., Jr., 1958. Professor of Chemistry and Associate of Lovett College
B.A. (1954) Rice Institute; Ph.D. (1957) University of California, Berkeley

Curtis, Doris M., 1980. Adjunct Professor of Geology and Geophysics
B.A. (1933) Brooklyn College; M.A. (1934), Ph.D. (1949) Columbia University

Cuthbertson, Gilbert Morris, 1963. Professor of Political Science and Resident Associate of Will Rice College
B.A. (1959) University of Kansas; Ph.D. (1963) Harvard University

Cyprus, Joel H., 1965. Lecturer in the Department of Electrical and Computer Engineering
B.A., B.S.E.E. (1959) Rice Institute; M.S. (1961), Ph.D. (1963) Rice University

Daichman, Graciela S., 1973. Lecturer on Spanish and Associate of Baker College
Profesorado (1958) Instituto Nacional del Profesorado en Lenguas Vivas; M.A. (1975), Ph.D.(1983) Rice University

Dakoulas, Panajiotis (Panos) Christos, 1987. Assistant Professor in Civil Engineering
Dipoloma (1980) National Technical University of Athens, Greece; M.Sc. (1982), Ph.D. (1985) Rensselaer Polytechnic Institute

Davezac, Bertrand M., 1979. Visiting Lecturer on Art History and Curator of the Institute for the Arts
B.A. (1957), Ph.D. (1971) Columbia University

Davidson, Chandler, 1966. Professor of Sociology
B.A. (1961) University of Texas; M.A. (1966), Ph.D. (1969) Princeton University

Davis, Kathleen A., 1984. Assistant Professor of Human Performance and Health Sciences
B.S. (1977) California State Polytechnic University; M.A. (1979), Ph.D. (1982) University of Southern California at Los Angeles

Davis, Philip W., 1969. Professor of Anthropology and Linguistics
B.A. (1961) University of Texas; Ph.D. (1965) Cornell

Davis, Sam H., Jr., 1957. Professor in the Department of Chemical Engineering, Professor of Mathematical Sciences, and Associate of Richardson College
B.A. (1952), B.S. (1953) Rice Institute; ScD. (1957) Massachusetts Institute of Technology

De Bremaecker, Jean-Claude, 1959. Professor of Geology and Geophysics and Associate of Jones College
Ingenieur Civil des Mines (1948) University of Louvain, Belgium; M.S. (1950) Louisiana State University; Ph.D. (1952) University of California, Berkeley

de Figueiredo, Rui J.P., 1965. Professor in the Department of Electrical and Computer Engineering and Professor of Mathematical Sciences
S.B. (1950)., S.M. (1952) Massachusetts Institute of Technology; Ph.D. (1959) Harvard University

Dennis, John E., 1979. Noah Harding Professor of Mathematical Sciences
B.S. (1962), M.S. (1964) University of Miami; Ph.D. (1966) University of Utah

Dessler, Alexander J., 1963. Professor of Space Physics and Astronomy and Associate of Hanszen College
B.S. (1952) California Institute of Technology; Ph.D. (1956) Duke University

D'Evelyn, Mark P., 1986. Assistant Professor of Chemistry
B.S. (1977) University of California, Los Angeles; Ph.D. (1982) University of Chicago

DeWitt, John Adams, 1982. Lecturer on Music, Trumpet
B.M. (1973) Northwestern University

Dharan, Bala G., 1982. Associate Professor of Accounting and Associate of Baker College
B.Tech. (1973) Indian Institute of Technology, India; M.B.A. (1975) Indian Institute of Management, India; M.S. (1977), Ph.D. (1981) Carnegie-Mellon University

Diddel, Roberta M., 1985. Adjunct Instructor of Psychology
B.A. (1976) Wesleyan University; Ph.D. (1985) Boston University

Dipboye, Robert, 1978. Professor of Psychology and Administrative Science
B.A. (1968) Baylor University; M.S. (1969), Ph.D. (1973) Purdue University

Disch, James G., 1973. Associate Professor of Human Performance and Health Sciences and Master of Sid Richardson College
B.S. (1969), M.Ed. (1970) University of Houston; P.E.D. (1973) Indiana University

Dix, Robert H., 1968. Lena Gohlman Fox Professor of Political Science and Associate of Baker College
B.A. (1951), M.A. (1953), Ph.D. (1962) Harvard University

Dodds, Stanley A., 1977. Associate Professor of Physics and Associate of Wiess College
B.S. (1968) Harvey Mudd College; Ph.D. (1975) Cornell University

Doody, Terrence Arthur, 1970. Professor of English and Associate of Jones College
A.B. (1965) Providence College; M.A. (1969), Ph.D. (1970) Cornell University

Doughtie, Edward Orth, 1963. Professor of English, Associate of Lovett College and Master of Will Rice College
A.B. (1958) Duke University; A.M. (1960), Ph.D. (1964) Harvard University

Downey, James P., 1986. Lieutenant, U.S. Navy, Visiting Assistant Professor of Naval Science
B.A. (1978) University of Texas, El Paso

Downs, Thomas D., 1971. Adjunct Professor of Statistics
B.S. (1960) Western Michigan University; M.P.H. (1962), Ph.D. (1965) University of Michigan

Dravis, Jeffrey J., 1987. Adjunct Associate Professor of Geology and Geophysics
B.S. (1971) St. Mary's University; M.S. (1977) University of Miami, Florida; Ph.D. (1980) Rice University

Dressel, Linda L., 1982. Assistant Professor of Space Physics and Astronomy and Associate of Brown College
B.S. (1971) University of Cincinnati; M.S. (1974) Cornell University; Ph.D. (1979) University of Virginia

Drew, Katherine Fischer, 1950. Lynette S. Autrey Professor of History and Associate of Will Rice College
B.A. (1944), M.A. (1945) Rice Institute; Ph.D. (1950) Cornell University

Driskill, Linda P., 1970. Associate Professor of English and Administrative Science
B.A. (1961), M.A. (1968), Ph.D. (1970) Rice University

Droxler, André W., 1987. Assistant Professor of Geology and Geophysics
Diploma (1978) University of Neuchatel, Switzerland; Ph.D. (1984) University of Miami, Florida

Duck, Ian M., 1963. Professor of Physics
B.S. (1955) Queen's University, Canada; Ph.D. (1961) California Institute of Technology

Dufour, Reginald J., 1975. Professor of Space Physics and Astronomy and Associate of Lovett College
B.S. (1970) Louisiana State University; M.S. (1971), Ph.D. (1974) Uniiversity of Wisconsin

Duke, Reese Dale, 1966. Lecturer on Education and Director of Student Teaching
B.S. (1950) Ouachita Baptist College; M.Ed. (1954), Ph.D. (1966) University of Texas

Dunbar, Robert B., 1981. Associate Professor of Geology and Geophysics and Resident Associate of Hanszen College
B.S. (1975) University of Texas; Ph.D. (1981) University of California, San Diego

Dunlap. William J., 1980. Adjunct Professor of Environmental Science
B.F.T. (1952) Texas A&M University; Ph.D. (1961) University of Oklahoma

Dunn, Josephine Marie, 1985. Lecturer on Art and Art History
B.A., M.F.A. (1975) University of Houston; M.A. (1978) University of Pennsylvania

Dunne, Carrin, 1975. Lecturer on Religious Studies
B.A. (1955) University of St. Thomas; M.A. (1965), Ph.D. (1970) University of Notre Dame

Dunning, F. Barry, 1972. Professor of Physics and of Space Physics and Astronomy and Associate of Jones College
B.Sc. (1966), Ph.D. (1969) University College, London, England

Durrani, Ahmad J., 1982. Associate Professor of Civil Engineering
B.S.C.E. (1968) Engineering University, Pakistan; M.S. (1975) Asian Institute of Technology, Thailand; Ph.D. (1982) University of Michigan

Dye, Ken, 1983. Lecturer on Music; Director, Marching Owl Band
B.Mus. (1974) University of Southern California; M.A. (1980) California State University, Long Beach; D.Ed. (1983) University of Houston

Dyson, Derek C., 1966. Professor in the Department of Chemical Engineering
B.A. (1955) University of Cambridge, England; Ph.D. (1966) University of London, England

Eaker, Helen Lanneau, 1964. Lecturer on Classics
B.A. (1944), Ph.D. (1955) University of North Carolina

Edwards, George, 1983. Adjunct Professor of Geology
B.S. (1941), Ph.D. (1946) University of Glasgow

Eggert, Allen W. 1968. Lecturer on Human Performance and Health Sciences
(1963) Rice University; M.A. (1967) California Western University

Eifler, Margret, 1973. Professor of German
B.A. (1962), M.A. (1964), Ph.D. (1969) University of California, Berkeley

Ellis, Grover, 1986. Lecturer on Administrative Science
B.S. (1942) University of Oklahoma; M.B.A. (1947) Harvard University

Ellison, Paul V.H., 1975. Associate Professor of Music
B.M.E. (1965) Eastern New Mexico University; M.M. (1966) Northwestern University

Engel, Paul S., 1970. Professor of Chemistry
B.S. (1964) University of California, Los Angeles; Ph.D. (1968) Harvard University

Engelhardt, Tristram Hugo, Jr., 1982. Professor of Philosophy
B.A. (1963), Ph.D. (1966) University of Texas; M.D. (1972) Tulane School of Medicine

Ensor, Katherine Bennett, 1987. Assistant Professor of Statistics
B.S.E. (1981), M.S. (1982) Arkansas State University; Ph.D. (1986) Texas A&M University

Eskin, Suzanne G., 1982. Adjunct Associate Professor of Biomedical Engineering
B.A. (1962), M.A. (1964) Rice University; Ph.D. (1969) University of Texas

Estle, Thomas L., 1967. Professor of Physics
B.A. (1953) Rice Institute; M.S. (1954), Ph.D. (1957) University of Illinois

Etnyre, Bruce R., 1984. Assistant Professor of Human Performance and Health Sciences
B.S. (1973) Valparaiso University; M.S. (1977) Purdue University; Ph.D. (1984) University of Texas at Austin

Evans, Dale W., 1981. Visiting Associate Professor of Human Performance and Health Sciences
B.S. (1962), M.S. (1966) George Williams College; H.S.D. (1969) Indiana University

Farrell, Michele Longino, 1984. Assistant Professor of French and Associate of Will Rice College
B.A. (1968) Rosary College; M.A. (1974) Claremont Graduate School; Ph.D. (1984) University of Michigan

Felleisen, Matthias, 1987. Assistant Professor of Computer Science
M.S. (1981) The University of Arizona; Ph.D. (1987) Indiana University

Few, Arthur A., 1970. Professor of Space Physics and Astronomy and Environmental Science
B.S. (1962) Southwestern University; M.B.S. (1965) University of Colorado; Ph.D. (1969) Rice University

Fischer, Michael M. J., 1981. Associate Professor of Anthropology and Associate of Baker College
B.A. (1967) Johns Hopkins University; Ph.D. (1973) University of Chicago

Fisher, Frank M., Jr., 1963. Professor of Biology and Associate of Jones College
B.A. (1953) Hanover College; M.S. (1958), Ph.D. (1961) Purdue University

Fisher, G. D., 1973. Adjunct Professor in the Department of Chemical Engineering
B.S. (1957) University of Texas; Ph.D. (1965) Johns Hopkins University

Fliegel, Raphael N., 1975. Professor of Music and Associate of Hanszen College

Ford, Wally, 1982. Lecturer on Architecture
B.S. (1975), M.C.E. (1976) Rice University

Forman, Robin, 1987. Assistant Professor of Mathematics
B.A. (1981), M.A. (1981) University of Pennsylvania; Ph.D. (1985) Harvard University

Frankowski, Ralph F., 1970. Adjunct Professor of Statistics
B.S. (1957), M.S. (1959) DePaul University; M.P.H. (1962), Ph.D. (1967) University of Michigan

Fred, Herbert L., M.D., 1974. Adjunct Professor of Human Performance and Health Sciences
B.A. (1950) Rice Institute; M.D. (1954) Johns Hopkins University School of Medicine

Freeman, John W., 1964. Lecturer on Religious Studies
B.S. (1957), M.S. (1961), Ph.D. (1963) University of Iowa

Freeman, Thomas F., 1972. Lecturer on Religious Studies
A.B. (1939) Virginia Union University; B.D. (1942) Andover Newton Theological School; Ph.D. (1948) University of Chicago

Friday, A. Randall, 1980. Lecturer on Accounting
B.B.A. (1973) University of Iowa; J.D.(1976) Stanford University

Fukuyama, Tohru, 1978. Associate Professor of Chemistry
B.S. (1971), M.A. (1973) Nagoya University, Japan; Ph.D. (1977) Harvard University

Gallop, Jane, 1985. Herbert S. Autrey Professor of Humanities
B.A. (1972), Ph.D. (1976) Cornell University

Gao, Zhiyong, 1986. Assistant Professor of Mathematics
B.S. Fudan University (197?); Ph.D. (1984) State University of New York at Stony Brook

Garcia, Charles Albert, 1974. Adjunct Assistant Professor in the Department of Electrical and Computer Engineering
A.A. (1965) University of Florida; M.D. (1969) Tulane Medical School

Garrity, Thomas, 1986. G. C. Evans Instructor of Mathematics
B.A. (1981) University of Texas; Ph.D. (1986) Brown University

Gaugler, Barbara B., 1987. Assistant Professor of Psychology
B.S. (1978) St. Lawrence University; M.S. (1981) Ohio University

Gehan, Edmund A., 1972. Adjunct Professor of Statistics
B.A. (1951) Manhattan University; M.S. (1953), Ph.D. (1957) North Carolina State University

Gentle, James E., 1981. Adjunct Professor of Mathematical Sciences
B.S. (1966) University of North Carolina; M.A. (1969) Louisiana State University; M.C.S. (1973), Ph.D. (1966) University of Texas

Ghazzaly, Osman I., 1972. Lecturer in Civil Engineering
B.S.C.E. (1958) University of Cairo, Egypt; M.S.C.E. (1963), Ph.D. (1966) University of Texas

Gibson, Kathleen R., 1981. Adjunct Associate Professor of Anthropology
B.A. (1963) University of Michigan; M.A. (1969), Ph.D. (1970) University of California, Berkeley

Gillman, Susan K., 1982. Assistant Professor of English
A.B. (1974) Bryn Mawr College; Ph.D. (1982) University of California

Glacken, Michael W., (1987). Assistant Professor of Chemical Engineering
B.S. (1980) University of Maryland; Ph.D. (1986) MIT

Glantz, Raymon M., 1969. Professor of Biology
B.A. (1963) Brooklyn College; M.S. (1964), Ph.D. (1966) Syracuse University

Glanville, James W., 1986. Professor of Finance and Vice-President for Financial Affairs and Treasurer of the University
B.S. (1944) Rice University; M.S. (1946), Professional Degree of Chemical Engineer (1958) California Institute of Technology

Glass, Graham P., 1967. Professor of Chemistry
B.S. (1960) Birmingham University, England; Ph.D. (1963) Cambridge University, England

Glowinski, Roland, 1986. Adjunct Professor of Mathematical Sciences
Ph.D. (1970) University of Paris

Golson, William G. 1984. Assistant Professor of Computer Science
B.A. (1970), University of California at Santa Cruz; M.S. (1979), Ph.D. (1984) University of Michigan

Gordon, Chad, 1970. Professor of Sociology and Associate of Hanszen College
B.S. (1957), M.A. (1962), Ph.D. (1963) University of California, Los Angeles

Gosain, Narendra K., 1981. Lecturer in Civil Engineering
B.A. (1963) University of Rajasthan, India; M.A. (1965) University of Roorkee, India; Ph.D. (1973) Rice University

Gottschalk, Arthur W., 1977. Associate Professor of Music
B.Mus. (1974), M.A. (1975), D.M.A. (1978) University of Michigan

Grandy, Richard E., 1980. Professor of Philosophy and Linguistics
B.A. (1963) University of Pittsburgh; M.A. (1965), Ph.D. (1968) Princeton University

Grayson, Marion L., 1983. Assistant Professor of Art and Art History
B.S. (1968), M.A. (1970), Ph.D. (1979) Columbia University

Griebling, Lynn, 1982. Artist Reacher of Music, Voice
B.Mus. (1967) St. Olaf's College; M.M. (1969) University of Wisconsin

Grob, Alan, 1961. Professor of English and Associate of Hanszen College
B.A. (1952) Utica College; M.A. (1957), Ph.D. (1961) University of Wisconsin

Gruber, Ira Dempsey, 1966. Harris Masterson, Jr. Professor of History and Associate of Hanszen College
A.B. (1955), M.A. (1959), Ph.D. (1961) Duke University

Hacker, Carl S., 1973. Adjunct Associate Professor of Statistics
B.S. (1963) William and Mary University; Ph.D. (1968) Rice University

Hagigi, Moshe, 1982. Assistant Professor of Accounting and Associate of Baker College
B.A. (1969), M.B.A. (1971) Hebrew University of Jerusalem; M.Ph. (1980), Ph.D. (1981) New York University

Hall, Elizabeth R., 1984. Adjunct Assistant Professor in the Biomedical Engineering Laboratory
B.S. (1968), M.S. (1969) Texas Women's University; Ph.D. (1974) University of Florida

Hallam, John S., 1981. Assistant Professor of Art History
B.A. (1970) Seattle University; M.A. (1974), Ph.D. (1979) University of Washington

Hammond, Michael P., 1986. Elma Schneider Professor of Music, Dean of the Shepherd School of Music and Associate of Hanszen College
B.A. (1959) Lawrence University; Honors B.A. (1959), M.A. (1961) Oxford University; L.H.D. (Hon.) (1975) Lawrence University

Hannon, James P., 1967. Professor of Physics and Associate of Wiess College
B.A. (1962), M.A. (1965), Ph.D. (1967) Rice University

Harcombe, Paul A., 1972. Professor of Biology
B.S. (1967) Michigan State University; Ph.D. (1973) Yale University

Harrison, Karey Lea, 1987. Mellon Instructor in Philosophy
B.A. (1982) La Trobe University, Melbourne, Australia

Hartley, Peter Reginald, 1986. Associate Professor of Economics
B.A. (1974) Australian National University; M.Ec. (1977) Australian National University; Ph.D. (1980) University of Chicago

Harvey, F. Reese, 1968. Professor of Mathematics B.S., M.A. (1963) Carnegie Institute of Technology; Ph.D. (1966) Stanford University

Haskell, Thomas L., 1970. Professor of History
B.A. (1961) Princeton University; Ph.D. Stanford University

Hatchett, Terry E., 1982. Adjunct Associate Professor of Accounting
B.B.A. (1968) Texas A&M University

Hatton, Gregory, 1983. Adjunct Associate Professor of Physics
B.S. (1970) Stanford University; Ph.D. (1974) University of California

Hauser, Nickolaus, 1986. Lecturer on Administrative Science
B.S. (1971), M.S. (1973) Polytechnic Institute of Brooklyn; M.B.A. (1985) University of Houston

Havens, Neil, 1964. Professor of Drama and Honorary Associate of Jones College
B.A. (1956) Rice Institute; M.A. (1959) Indiana University

Hayes, Edward F., 1987. Professor of Chemistry and Associate Provost and Vice-President for Information Systems
B.S. (1963) University of Rochester; M.A. (1965), Ph.D. (1966) The Johns Hopkins University

Haymes, Robert C., 1964. Professor of Space Physics and Astronomy and Associate of Will Rice College
B.A. (1952), M.S. (1953), Ph.D. (1959) New York University

Hazlewood, Carlton F., 1970. Adjunct Professor of Biophysics in the Physics Department
B.S. (1957) Texas A&M University; Ph.D. (1962) University of Tennessee Medical Units at Memphis

Heitman, Elizabeth, 1987. Adjunct Lecturer on Religious Studies
B.A. (1979), M.A. (1985) Rice University

Hellums, Jesse David, 1960. Foyt Family Professor of Chemical Engineering, Dean of the George R. Brown School of Engineering and Associate of Wiess College
B.S. (1950), M.S. (1958) University of Texas; Ph.D. (1961) University of Michigan

Hempel, John, 1964. Professor of Mathematics
B.S. (1957) University of Utah; M.S. (1959), Ph.D. (1962) University of Wisconsin

Heymann, Dieter, 1966. Professor of Geology and Geophysics and of Space Physics and Astronomy and Associate of Lovett College
M.S. (1954). Ph.D. (1958) University of Amsterdam, Netherlands

Hightower, Joe W.,1967. Professor in the Department of Chemical Engineering and Associate of Baker College
B.S. (1959) Harding College; M.A. (1961), Ph.D. (1963) Johns Hopkins University

Hill, Albina Serebryakova, 1982. Lecturer on Russian in the Department of German and Russian
M.A. (1959) Sverdlorsk Pedagogical Institute

Hill, N. Ross, 1984. Associate Professor of Geophysics
B.S. (1971) Louisiana State University; M.S. (1973) University of New Orleans; Ph.D. (1978) University of Virginia

Hirschey, Mark, 1986. Associate Professor of Administrative Science
B.A. (1972) St. John's University, Collegeville; M.S. (1974), Ph.D. (1977) University of Wisconsin, Madison

Holloway, Clyde, 1977. Professor of Music
B.Mus. (1957), M.Mus. (1959) University of Oklahoma; D.S.M. (1974) Union Theological Seminary

Holt, Edward C., 1956. Professor of Civil Engineering, Proctor, and Associate of Richardson College
S.B. (1945), S.M. (1947) Massachusetts Institue of Technology; Ph.D. (1956) Pennsylvania State University

Hood, Robert T., 1982. Assistant Professor of Computer Science and Associate of Brown College
B.A. (1976), University of Virginia; M.S. (1979), Ph.D. (1982) Cornell University

House, Waylon V., 1986. Adjunct Associate Professor of Chemical Engineering
B.S. (1966) Massachusetts Institute of Technology; M.S. (1969), Ph.D. (1974) University of Pittsburgh

Howell, William C., 1968. Herbert S. Autrey Professor of Psychology and Administrative Science
B.A. (1954), M.A. (1956), Ph.D. (1958) University of Virginia

Hsi, Barthotomew P., 1973. Adjunct Professor of Statistics
M.A. (1962), Ph.D. (1964) University of Minnesota

Huang, Huey W., 1973. Professor of Physics
B.S. (1962) National Taiwan University; Ph.D. (1967) Cornell University

Huberman, Brian Michael, 1975. Associate Professor of Art
Certificate (1974) National Film School of Great Britain

Huddle, Donald L. 1964. Professor of Economics
B.S. (1959), M.A. (1960) University of California, Berkeley; Ph.D. (1964) Vanderbilt University

Hudspeth, C. M., 1947. Lecturer on Political Science and Associate of Wiess College
B.A. (1940) Rice Institute; J.D. (1946) University of Texas

Hulet, Randall G., 1987, Assistant Professor of Physics
B.S. (1978) Standord University; Ph.D. (1984) Massachusetts Institute of Technology

Hurley, Patricia A., Lecturer on Political Science
B.A. (1972) Tulane University; M.A. (1975), Ph.D. (1976) Rice University

Huston, J. Dennis, 1969. Professor of English and Associate of Hanszen
B.A. (1961) Wesleyan University; M.A. (1964), Ph.D. (1966) Yale University

Hutchinson, John S., 1983. Assistant Professor of Chemistry
B.S. (1977), Ph.D. (1980) University of Texas

Hyman, Harold M., 1968. William P. Hobby Professor of History and Associate of Lovett College
B.A. (1948) University of California, Los Angeles; M.A. (1950), Ph.D. (1952) Columbia University

Iammarino, Nicholas K., 1978. Associate Professor of Human Performance and Health Sciences and Associate of Sid Richardson College

B.S. (1973) University of Dayton; M.Ed. (1975) University of Toledo; Ph.D. (1978) Ohio State University

Ingersoll, Richard J., 1986. Assistant Professor of Architecture

B.A. (1979) University of California, Berkeley; Ph.D. (1985) University of California, Berkeley

Isgur, Marvin, 1983. Adjunct Associate Professor of Administrative Science

B.S. (1974) University of Houston; M.B.A. (1978) Stanford

Isle, Walter Whitfield, 1962. Professor of English and Master of Jones College

A.B. (1955) Harvard University; M.A. (1957) University of Michigan; Ph.D. (1961) Stanford University

Jansson, Birger, 1975. Adjunct Professor of Statistics

B.A. (1946), Ph.D. (1965) University of Stockholm, Sweden

Jeys, Thomas H., 1982. Assistant Professor of Physics

B.S. (1972), M.S. (1975) Univerfsity of Houston; Ph.D. (1982) Rice University

Johnson, Don Herrick, 1977. Professor in the Department of Electrical and Computer Engineering and Associate of Will Rice College

S.B., S.M. (1970), E.E. (1971), Ph.D. (1974) Massachusetts Institute of Technology

Johnson, William A., 1984. Professor of Economics

B.A. (1958), Syracuse University; M.A. (1960), Ph.D. (1964), Harvard University

Johnston, Dennis A., 1974. Adjunct Associate Professor of Statistics

B.S. (1965) Arlington State College; M.A. (1966) University of Texas; Ph.D. (1971) Texas Tech University

Jones, B. Frank, Jr., 1962. Noah Harding Professor of Mathematics

B.A. (1958) Rice Institute; Ph.D. (1961) Rice University

Jones, Robert, 1981. Associate Professor of English

B.A. (1970) Memphis State University; M.A. (1972) Southern Illinois University; Ph.D. (1981) University of Wisconsin

Jones, Roy G., 1967. Associate Professor of Russian

B.A. (1954), M.A. (1954) East Texas State University; Ph.D. (1965) University of Texas

Jones, Samuel, 1973. Professor of Music and Honorary Associate of Lovett College

B.A. (1957) Millsaps College; M.A. (1958), Ph.D. (1960) Eastman School of Music, University of Rochester

Jost, Robert J., 1980. Adjunct Assistant Professor of Space Physics and Astronomy

B.S. (1974) Portland State University; M.A. (1977), Ph.D. (1979) Rice University

Jump, J. Robert, 1968. Professor of Computer Science in the Department of Electrical and Computer Engineering and Master of Lovett College

B.S. (1960), M.S. (1962) University of Cincinnati; M.S. (1965), Ph.D. (1968) University of Michigan

Karff, Samuel E., 1979. Lecturer on Religious Studies

A.B. (1949) Gratz College of Jewish Studies; A.B. (1953) Harvard College; M.A.H.L. (1956), D.H.L. (1961) Hebrew Union College

Kasper, Jerome V. V., 1982. Adjunct Associate Professor of Chemistry

B.S. (1961) California Institute of Technology; Ph.D. (1965) University of California, Berkeley

Kauffmann, Robert Lane, 1976. Assistant Professor of Spanish and Associate of Hanszen College

B.A. (1970) Princeton University; Ph.D. (1981) University of California, San Diego

Keeley, Jack W., 1980. Adjunct Professor in the Department of Environmental Science and Engineering

B.S. (1957) University of Oklahoma; S.M. (1958) Harvard University

Kelber, Werner H., 1973. Isla Carroll Turner and Percy E. Turner Professor of Religious Studies

M.T. (1963) Princeton Theological Seminary; M.A. (1967), Ph.D. (1970) University of Chicago

Kendall, Richard P., 1981. Adjunct Professor of Mathematical Sciences
B.A. (1963), M.A. (1969) University of Texas; M.A. (1970), Ph.D. (1972) Rice University

Kennedy, Kenneth W., Jr., 1971. Noah Harding Professor in Mathematics in the Department of Computer Science
B.A. (1967) Rice University; M.S. (1969), Ph.D. (1971) New York University

Kiepper, Alan F., 1982. Associate Professor of Public Administration
B.A. (1950) University of New Hampshire; M.P.A. (1960) Wayne State University

Kim, Dae Mann, 1970. Professor in the Department of Electrical and Computer Engineering
B.S. (1960) Seoul National University, Korea; M.S. (1965), Ph.D. (1967) Yale University

Kinsey, James L., 1987. D.R. Bullard-Welch Foundation Professor of Science in Department of Chemistry and Dean of Natural Sciences
B.A. (1956), Ph.D. (1959) Rice University

Kiperman, Anita, Lecturer on Spanish and Associate of Hanszen College
B.A. (1957) Universidad Nacional de Buenos Aires; M.A. (1971) University of Houston

Kirk, David E., 1982. Lecturer on Music, Tuba
B.M. (1982) Juilliard School of Music

Klineberg, Stephen L., 1972. Professor of Sociology and Associate of Lovett College
B.A. (1961) Haverford College; M.A. (1963) University of Paris, France; Ph.D. (1966) Harvard University

Kluger, Luisa, 1984. Lecturer on Spanish
B.A. (1972) The Hebrew University of Jerusalem; M.A. (1984) Rice University

Kobayashi, Riki, 1951. Louis Calder Professor in the Department of Chemical Engineering and Associate of Will Rice College
B.S. (1944) Rice Institute; M.S.E. (1947), Ph.D. (1951) University of Michigan

Kolenda, Konstantin, 1953. Carolyn and Fred McManis Professor of Philosophy
B.A. (1950) Rice Institute; Ph.D. (1953) Cornell University

Konrad, Linn B., 1980. Associate Professor of French and Associate of Baker College
B.A. (1968) University of Oslo, Norway; M.A. (1972) University of Wisconsin at Milwaukee; Ph.D. (1978) University of Minnesota

Kossowski, Marek, 1983. G.C. Evans Instructor of Mathematics
B.S. (1976), Stetson University; M.S. (1980), Ph.D. (1982) University of North Carolina

Krentel, Mark, 1987. Assistant Professor of Computer Science
B.S. (1978), M.S. (1979) Clarkson University; Ph.D. (1986) Cornell

Krishen, Kumar, 1986. Adjunct Associate Professor of Electrical and Computer Engineering
B.A. (1959) Jammu & Kashmir University; M.S. (1966), Ph.D. (1969) Kansas State University

Kroger, Harry, 1987. Adjunct Professor in the Department of Electrical and Computer Engineering
B.S. (1957) University of Rochester; Ph.D. (1962) Cornell University

Kroopnick, Peter M., 1982. Adjunct Professor of Geology
B.S. (1963) Wayne State University; M.S. (1965) University of California, Berkeley; Ph.D. (1971) University of California, San Diego

Kulstad, Mark, 1975. Associate Professor of Philosophy and Associate of Hanszen College
B.A. (1969) Macalester College; Ph.D. (1975) University of Michigan

Kung, Hans, 1987. Mellon Distinguished Visiting Professor of Humanities
Th.D. (1957) Paris, Sorbonne

Lairson, David Robert, 1977. Adjunct Associate Professor of Economics
B.A. (1970), M.A., Ph.D. (1975) University of Kentucky

Lamb, Sydney M., 1981. Agnes Cullen Arnold Professor of Linguistics
B.A. (1951) Yale University; Ph.D. (1958) University of California, Berkeley

Lane, David M., 1976. Associate Professor of Psychology and Resident Associate of Lovett College

B.A. (1971) Clark University; M.A. (1973) Tufts University; Ph.D. (1977) Tulane University

Lane, Neal F., 1966. Professor of Physics and Provost of the University

B.S. (1960), M.S. (1962), Ph.D. (1964) University of Oklahoma

Laughery, Kenneth R., 1982. Henry R. Luce Professor of Psychology

B.S. (1957), M.S. (1959), Ph.D. (1961) Carnegie-Mellon University

Lavenda, Richard A., 1987. Assistant Professor of Theory and Composition in the Shepherd School of Music

B.A. (1977) Dartmouth College; M.Mus. (1979) Rice University D.M.A. (1983) University of Michigan

Leal, Maria Teresa, 1965. Professor of Spanish and Portuguese, and Associate of Sid Richardson College

B.A. (1946) Pontificia Universidade Catolica, Brazil; Ph.D. (1963) Universidade Federal

Lee, Eva J., 1969 Associate Professor of Human Performance and Health Sciences, Director of Equal Employment Opportunity Programs, and Associate of Jones College

B.S. (1962) North Texas State University; M.Ed. (1967) Sam Houston State University, Ed.D. (1974) Louisiana State University

Leeds, J. Venn, Jr., 1964. Professor of Electrical and Computer Engineering

B.A. (1955), B.S.E.E. (1956) Rice Institute, M.S.E.E. (1960), Ph.D. (1963) University of Pittsburgh, J.D. (1972) University of Houston

Leeman, William P., 1977. Professor of Geology and Geophysics

B.A. (1967), M.A. (1969) Rice University, Ph.D. (1974) University of Orgeon

Levander, Alan R., 1984. Assistant Professor of Geophysics and Resident Associate of Hanszen College

B.S. (1976) University of South Carolina; M.S. (1978), Ph.D. (1984), Stanford University

Levin, Donald N., 1963. Professor of Classics

B.A. (1949), M.A. (1952) Cornell University; M.A. (1954), Ph.D. (1957) Harvard University

Levine, Richard B., 1986. Adjunct Assistant Professor of Biology

B.S. (1973) University of Oregon; Ph.D. (1978) State University of New York, Albany

Lewis, Edward S., 1948. Professor of Chemistry

B.S. (1940) University of California, Berkeley; Ph.D. (1947) Harvard University

Lindley, Juanita W., 1986. Instructor of Human Performance and Health Sciences

B.A.T. (1976) Sam Houston State University; M.S. (1977) James Madison University

Lipartito, Kenneth James, 1987. Adjunct Assistant Professor of History

B.A. (1980) University of Delaware; M.A. (1982), Ph.D. (1986) Johns Hopkins University

Livaudais, Alfred F., Jr., 1984. Major, U.S. Army, and Professor of Military Science

B.S. (1973) Nicholls State University; M.P.S. (1979) Western Kentucky University

Loewenheim, Francis Lippmann, 1959. Professor of History A.B. (1947), A.M. (1948) University of Cincinnati; Ph.D. (1952) Columbia University

Logan, Marie-Rose, 1983. Associate Professor of French

Licence en Philologie Classique (1966); Agrégation de Philosophie et Lettres (1967) Université Libre de Bruxelles; M.Ph. (1970), M.A. (1972), Ph.D. (1974) Yale University

Lombard, Jeanette, 1982. Artist Teacher of Voice

Artists Diploma (1957) Teatro Lirico Sperimentale di Spoleto, Italy; Certificate (1958) Accademia di Santa Cecilia, Rome, Italy

Long, Elizabeth, 1978. Associate Professor of Sociology and Associate of Brown College

B.A. (1966) Stanford University; M.A. (1974), Ph.D. (1979) Brandeis University

Loukissas, Philippos J., 1987. Adjunct Associate Professor of Administrative Science

Diploma (1968) National Technical University of Athens; M.A. (1970) University of Pennsylvania; Ph.D. (1977) Cornell University

Loutzenheiser, Roy C., 1982. Lecturer in Civil Engineering

B.S.E. (1966) Ohio State University; M.S.C.E. (1968) Georgia Institute of Technology; Ph.D. (1972) Texas A&M University

Luca, Sergiu, 1983. Dorothy Richard Starling Professor of Violin
Artists Diploma (1966) Curtis Institute of Music

Lurie, Susan, 1987. Assistant Professor of English
B.A. (1969), SUNY; M.A. (1972) University of California, Berkeley

Lutes, Loren D., 1967. Professor in the Department of Civil Engineering
B.S. (1960), M.S. (1961) University of Nebraska; Ph.D. (1967) California Institute of Technology

Lynch, Edward C., 1970. Adjunct Professor in the Biomedical Engineering Laboratory
A.B. (1953), M.D. (1956) University of Washington

Maas, Michael, 1984. Assistant Professor of History and Associate of Baker College
B.A. (1973) Cornell University; M.A. (1974), Ph.D. (1982) University of California, Berkeley

Malone, David R., 1983. Lecturer in Music, Double Bass
B.Mus. (1981), M.Mus. (1981) Shepherd School of Music, Rice University

Maranhao, Tullio P., 1982. Associate Professor of Anthropology
B.A. (1970) Universidade Federal do Rio de Janeiro; M.A. (1975) Universidade de Brasilia; Ph.D. (1981) Harvard University

Marcus, George E., 1975. Professor of Anthropology and Associate of Richardson College
B.A. (1968) Yale University; Ph.D. (1976) Harvard University

Margrave, John L., 1963. E.D. Butcher Professor of Chemistry
B.S. (1948), Ph.D. (1951) University of Kansas

Marowsky, Gerd H., 1980. Adjunct Professor in the Department of Electrical and Computer Engineering
B.S. (1966) Technical University, Germany; Ph.D. University of Gottingen, Germany

Martin, Joseph P., 1981. Assistant Professor of Biology and Associate of Wiess College
A.B. (1973) Harvard University; Ph.D. (1979) Duke University

Martin, Randi C., 1982. Associate Professor of Psychology
B.A. (1971) University of Oregon; M.S. (1977), Ph.D. (1979) Johns Hopkins University

Martin, William C., 1968. Professor of Sociology and Associate of Richardson College
B.A. (1958), M.A. (1960) Abilene Christian College; B.D. (1963) Harvard Divinity School; Ph.D. (1969) Harvard University

Matthews, Kathleen Shive, 1972. Professor of Biochemistry
B.S. (1966) University of Texas; Ph.D. (1970) University of California, Berkeley

Mattson, Joan C., Adjunct Professor of Biomedical Engineering
B.A. (1958) Northwestern University; M.D. (1962) Northwestern Medical School

Matusow, Allen Joseph, 1963. William Gaines Twyman Professor of History, Dean of the School of Humanities, and Associate of Hanzen College
B.A. (1958) Ursinus College; M.A. (1959), Ph.D. (1963) Harvard University

Mayer, Uri, 1986. Artist Teacher, Conducting, Music Director, Shepherd Symphony Orchestra
Diploma (1964) Tel Aviv Conservatory of Music, Diploma (1968) University of Tel Aviv, Graduate Diploma (1970) Juilliard School of Music

McCormick, Peggy V., 1983. Adjunct Lecturer on Accounting
B.S. (1971) University of Tennessee; M.P.A. (1975) Georgia State University

McEvilley, Thomas, 1969. Visiting Lecturer on Art History
B.A. (1963) University of Cincinnati; M.A. (1965) University of Washington; Ph.D. (1968) University of Cincinnati

McIntire, Larry V., 1970. E.D. Butcher Professor of Chemical and Biomedical Engineering
B.Ch.E., M.S. (1966) Cornell University; M.A. (1968), Ph.D. (1970) Princeton University

McIntosh, Roderick J., 1980. Associate Professor of Anthropology and Co-Master of Baker College
B.A. (1973) Yale University; M.Litt. (1975), Ph.D. (1979) Trinity College, University of Cambridge, England

McIntosh, Susan Keech, 1980. Associate Professor of Anthropology and Co-Master of Baker College

B.A. (1975) Girton College, University of Cambridge; M.A. (1976), Ph.D. (1979) University of California, Santa Barbara

McLellan, Rex B., 1964. Professor of Materials Science and Associate of Brown College

B.Met. (1957) Sheffield University, England; Ph.D. (1962) Leeds University, England

McNeil, Linda M., 1984. Associate Professor of Education and Associate of Jones College

B.A. (1966), Texas Tech University; M.A. (1968), Baylor University; Ph.D. (1977) University of Wisconsin-Madison

McQuilkin, Caryn, 1986. Lecturer on Administrative Science

B.S. (1974) Indiana University; M.B.A. (1977) University of Chicago

Meconi, Honey, 1987. Assistant Professor of Musicology in the Shepherd School of Music

A.B. (1974) Pennsylvania State University; A.M. (1980) Harvard University; Ph.D. (1986) Harvard University

Meeks, William Hamilton, III, 1984. Professor of Mathematics

B.A. (1971), M.A. (1974), Ph.D. (1975) University of California, Berkeley

Meixner, John, 1968. Professor of English and Associate of Sid Richardson College

B.A. (1951) City College of New York; M.A. (1953), Ph.D. (1957) Brown University

Merwin, John E., 1955. Professor in the Department of Civil Engineering

B.A. (1952), B.S.M.E. (1953), M.S.M.E. (1955) Rice Institute; Ph.D. (1962) University of Cambridge, England

Michel, F. Curtis, 1963. Andrew Hays Buchanan Professor of Astrophysics in the Departments of Space Physics and Astronomy and of Physics and Associate of Jones College

B.A. (1955), Ph.D. (1962) California Institute of Technology

Middleton, David, 1981. Adjunct Professor of Mathematical Sciences

B.A. (1942), M.A. (1945), Ph.D. (1947) Harvard University

Miele, Angelo, 1964. Professor of Aerospace Sciences and Mathematical Sciences

Dr. C.E. (1944), Dr. A. E. (1946) University of Rome, Italy

Mieszkowski, Peter, 1981. Allyn R. and Gladys M. Cline Professor of Economics and Finance

B.S. (1957), M.A. (1959) McGill University; Ph.D. (1963) Johns Hopkins University

Miettinen, Hannu E., 1977. Associate Professor of Physics

Fil. Kand. (1967), Fil. Lic. (1971) University of Helsinki, Finland; Ph.D. (1975) University of Michigan

Milburn, Ellsworth, 1975. Professor of Music and Associate of Baker College

A.B. (1962) University of California, Los Angeles; M.A. (1968) Mills College; D.M.A. College-Conservatory of Music, University of Cincinnati

Miller, Clarence A., 1981. Professor in the Department of Chemical Engineering

B.A., B.S. (1961) Rice University; Ph.D. (1969) University of Minnesota

Mitchell, E. Douglas, 1981. Adjunct Professor of Linguistics and Semiotics

B.A. (1952) Baylor University; Ph.D. (1966) University of Texas

Mitchell, O. Jackson, 1966. Professor of Architecture and Dean of the School of Architecture

B.Arch. (1954) Washington University; M.Arch., M.C.P. (1961) University of Pennsylvania

Mixon, John, 1970. Lecturer on Architecture

B.B.A. (1952) Stephen F. Austin State University; J.D. (1955) University of Houston; L.L.M. (1962) Yale University

Molder, Robert P., 1982. Lecturer on Humanities B.A. (1968), M.A. (1977) University of Texas, El Paso

Moorhead, Louise C., 1986. Adjunct Assistant Professor of Chemical Engineering

B.A. (1969) University of South Florida; M.D. (1973) Univ. of Florida, Gainesville

Morgan, T. Clifton, 1987. Assistant Professor of Political Science

B.A. (1978) University of Oklahoma; M.A. (1980), Ph.D. (1986) University of Texas at Austin

Morris, Wesley Abram, 1968. Professor of English
B.A. (1961), M.A. (1963) University of Kentucky; Ph.D. (1968) University of Iowa

Morshedi, A. Michael, 1987. Adjunct Professor of Mathematical Sciences
B.S. (1969), M.S. (1971), Ph.D. (1973) University of Missouri

Murphy, Paul H., 1979. Adjunct Associate Professor in the Department of Electrical and Computer Engineering
A.B. (1965) Northeastern University; M.S. (1968), Ph.D. (1970) University of Kansas

Mutchler, Gordon S., 1968. Professor of Physics
B.S. (1960), Ph.D. (1966) Massachusetts Institute of Technology

Napier, H. Albert, 1983. Associate Professor of Administrative Science
B.A. (1966), M.B.A. (1968), Ph.D. (1971) University of Texas at Austin

Nelson, Deborah Hubbard, 1974. Associate Professor of French and Associate of Brown College
B.A. (1960) Wittenberg University; Certificat d'etudes Francaises, ler Degré (1961) University of Grenoble, France; M.A. (1964), Ph.D. (1970) Ohio State University

Newfield, Christopher, 1987. Assistant Professor of English
B.A. (1979) Reed College; M.A. (1984) Cornell University

Newman, James H., 1985. Adjunct Assistant Professor of Space Physics and Astronomy
B.A. (1978) Dartmouth College; M.A. (1982), Ph.D. (1984) Rice University

Newton, Norma, 1982. Artist Teacher of Voice
B.Mus. (1958) Syracuse University; M.Mus (1962) University of Texas

Nielsen, Niels C., Jr. 1951. J. Newton Rayzor Professor of Philosophy and Religious Thought
B.A. (1942) George Pepperdine University; B.D., (1946) Ph.D. (1951) Yale University

Noble, Stephen T., 1986. Adjunct Assistant Professor of Space Physics and Astronomy
B.S. (1980) Florida Institute of Technology; M.S. (1983), Ph.D. (1985) Rice University

Norris, Mary, 1975. Professor of Music
Artists Diploma in Piano (1939) Curtis Institute of Music

Nudelman, Harvey, 1985. Adjunct Lecturer in Electrical and Computer Engineering
B.S. (1961) Washington University; M.S. (1965) Iowa State University; Ph.D. (1971) University of Illinois Medical Center

O'Dell, Charles Robert, 1982. Professor of Space Physics and Astronomy
B.S.Ed. (1959) Illinois State University; Ph.D. (1962) University of Wisconsin

Oldow, John Steven, 1978. Associate Professor of Geology and Geophysics
B.S. (1972) University of Washington; Ph.D. (1978) Northwestern University

Olson, John Steven, 1973. Professor of Biochemistry and Associate of Hanszen College
B.S. (1968) University of Illinois; Ph.D. (1972) Cornell University

Overall, John E., 1983. Adjunct Professor of Psychology
B.S. (1954) Trinity University; M.A. (1956), Ph.D. (1958) University of Texas

Page, Paula, 1985. Artist Teacher, Harp
B.Mus. (1969) Cleveland Institute of Music

Palmer, Graham A., 1974. Professor of Biochemistry and Associate of Sid Richardson College
B.S. (1957), Ph.D. (1962) University of Sheffield, England

Panko, Walter B., 1985. Adjunct Professor of Computer Science
B.S. (1965) University of Illinois; Ph.D. (1969) University of Missouri

Papademetriou, Peter C., 1968. Professor of Architecture
B.A. (1965) Princeton University; M.Arch. (1968) Yale University

Papamichalis, Panagiotis E., 1985. Lecturer in Electrical and Computer Engineering
B.S. (1967) National Technical University, Athens, Greece; M.S.E.E. (1975), Ph.D. (1980) Georgia Institute of Technology

Papoutsakis, Eleftherios T., 1980. Adjunct Associate Professor in the Department of Chemical Engineering
Diploma of Chemical Engineering (1974) National Technical University of Athens, Greece; M.S. (1976), Ph.D. (1980) Purdue University

Parks, Thomas W., 1967. Professor in the Department of Electrical and Computer Engineering
B.E.E. (1961), M.S. (1964), Ph.D. (1967) Cornell University

Parry, Ronald J., 1978. Professor of Chemistry
B.A. (1964) Occidental College; Ph.D. (1968) Brandeis University

Parsons, Spencer W., 1969. Associate Professor of Architecture
B.A. (1953) University of Michigan; M.Arch. (1963) Harvard University

Patten, Robert L., 1969. Professor of English and Associate of Brown College
B.A. (1960) Swarthmore College; M.A. (1962), Ph.D. (1965) Princeton University

Peaceman, Donald W., 1983. Adjunct Professor of Mathematical Sciences
B.Ch.E. (1947) College of the City of New York; Sc.D. (1952) Massachusetts Institute of Technology

Pearlman, Michael David, 1980. Lecturer in Computer Science and Associate of Sid Richardson College
B.S. (1975) Carlton University, Canada; M.S. (1978) Cornell University

Pearson, James Boyd, Jr., 1965. J.S. Abercrombie Professor in the Department of Electrical and Computer Engineering
B.S.E.E. (1958), M.S.E.E. (1959) University of Arkansas; Ph.D. (1962) Purdue University

Pegg, Ian, 1987. Assistant Professor of Chemical Engineering
B.S. (1978), Ph.D. (1982) University of Sheffield, England

Perez, J. Bernardo, 1979. Assistant Professor of Spanish
Licenciatura (1972) Universidad de Granada, Spain; M.A. (1974), Ph.D. (1982) University of Iowa

Peters, Albert W., 1983. Instructor of Human Performance and Health Sciences

Perry, John, 1983. Artist Teacher, Piano
B.Mus. (1956), M.Mus. (1957) Eastman School of Music, University of Rochester

Pfeiffer, Paul E., 1947. Professor of Mathematical Sciences and Electrical and Computer Engineering and Associate of Brown College
B.S.E.E. (1938) Rice Institute; B.D. (1943) Southern Methodist University; M.S.E.E. (1948), Ph.D. (1952) Rice Institute

Pharr, George M., 1980. Associate Professor of Materials Science and Associate of Weiss College
B.S.M.E. (1975) Rice University; M.S.M.S. (1977), Ph.D. (1979) Stanford University

Phenix, Linda G., 1981. Instructor of Human Performance and Health Sciences
B.F.A. (1977) University of Texas; M.A. (1978) Sam Houston State University

Phillips, Gerald C., 1949. Professor of Physics
B.A. (1944), M.A. (1947), Ph.D. (1949) Rice Institute

Phillips, Jr., George N., 1987. Associate Professor of Biochemistry
B.S. (1974), Ph.D. (1977) Rice University

Phillips, Lyn Bracewell, 1986. Lecturer on Humanities
B.A. (1968) Vanderbilt University; Ph.D. (1980) University of Texas

Philpott, Charles William, 1964. Professor of Biology and Associate of Baker College
B.A. (1957), M.S. (1958) Texas Technological College; Ph.D. (1962) Tulane University

Pickar, Richard W., 1976. Associate Professor of Music
B.A. (1956) University of California, Los Angeles; Diploma (1957) Akademie fur Musik und darstellende Kunst, Austria; M.A. (1964) Sam Houston State University

Pier, Stanley M., 1974. Adjunct Associate Professor of Environmental Science
B.S. (1948) Brooklyn College; Ph.D. (12952) Purdue University

Piper, William Bowman, 1969. Professor of English B.A. (1951) Harvard University; M.A. (1952) Columbia University; Ph.D. (1958) University of Wisconsin

Poindexter, Hally Beth W., 1965. Professor of Human Performance and Health Sciences and Associate of Jones College
B.A. (1947) Rice Institute; B.S. (1949) University of Houston; M.A. (1950) University of Northern Colorado; Ed.D. (1957) Columbia University

Polking, John C., 1968. Professor of Mathematics and Associate of Baker College
B.S. (1956) University of Notre Dame; M.S. (1961), Ph.D., (1966) University of Chicago

Polakoff, Michael A., 1987. Assistant Professor of Administrative Science
B.A. (1976) Harpur College; M.B.A. (1979) Ph.D. (1986) State University of New York at Binghamton

Pollitt, Ernesto, 1981. Adjunct Professor of Anthropology B.A. (1957) University of Lima; Ph.D. (1968) Cornell University

Pollock, Lori, 1986. Assistant Professor of Computer Science
B.S. (1981), M.S. (1983) Allegheny College; Ph.D. (1986) University of Pittsburgh

Poon, Yat Sun, 1987. Assistant Professor of Mathematics
GCE A-Level (1977) Won Fut Nam College; B.S. (1981) Chinese University; Ph.D. (1985) Oxford University

Pope, Albert H., 1986. Assistant Professor of Architecture
B.Arch. (1978) Southern California Institute of Architecture; M.Arch. (1986) Princeton University

Poulos, Basilios N., 1975. Professor of Art and Associate of Brown College
B.F.A. (1965) Atlanta School of Art; M.F.A. (1968) Tulane University

Procunier, James D., 1979. Assistant Professor of Biology
B.S. (1966), M.S. (1968) University of British Columbia, Canada; Ph.D. (1973) University of Calgary, Canada

Pyung-Soo, Kim, 1981. Instructor of Human Performance and Health Sciences
B.A. (1963) Han Kak University of Foreign Studies, South Korea

Quiocho, Florante A., 1972. Adjunct Professor of Biochemistry
B.S. (1959) Central Philippine University; M.S. (1961) Howard University; Ph.D. (1966) Yale University

Raaphorst, Madeleine Rousseau, 1963. Professor of French
Baccalaureat es lettres (1939) Université de Poitiers, France; Licence en droit (1943) Université de Paris, France; Ph.D. (1959) Rice Institute

Rabson, Thomas Avelyn, 1959. Professor of Electrical and Computer Engineering
B.A. (1954), B.S.E.E. (1955), M.A. (1957), Ph.D. (1959) Rice Institute

Rachal, Joel P., 1986. Lieutenant, U.S. Navy, Visiting Assistant Professor of Naval Science
B.S.E.E. (1977) Louisiana State University

Rasmussen, David Tab, 1987. Assistant Professor of Anthropology
B.A. (1980) Colorado College; Ph.D. (1986) Duke University

Rau, Carl, 1983. Professor of Physics
Diplom-Physiker (1967), Dr.rer.nat. (1970) Technical University, Munich, Germany

Raulston, Dwight L., 1985. Adjunct Insrtructor of Computer Science
B.A. (1975), Ph.D. (1979) Rice University

Raymond, Richard L., 1986. Adjunct Professor of Environmental Science
B.S. (1947), M.S. (1951) University of Illinois

Rea, Joan, 1968. Associate Professor of Spanish and Portuguese and Master of Wiess College
B.A. (1954) New York University; M.A. (1964) University of Houston; Ph.D. (1970) University of Texas

Reiner, Martin A., 1985. Lecturer on Architecture
B.A. (1966) City College of City University of New York; M.P.A. (1968) Ph.D. (1973) Maxwell School, Syracuse University

Reiser, Stanley J., 1983. Adjunct Professor of Religious Studies
A.B. (1959) Columbia University; M.D. (1963) State University of New York Downstate Medical Center; M.P.A. (1966) John F. Kennedy School of Government, Harvard University; Ph.D. (1970) Harvard University

Retiz, Leonard, 1986. Lecturer on German
B.A. (1961), Ph.D. (1970) University of Texas at Austin

Riese, W.C. Rusty, 1985. Adjunct Assistant Professor of geology and Geophysics
B.S. (1973) New Mexico Institute of Mining and Technology; M.S. (1977), Ph.D. (1980) University of New Mexico

Rimlinger, Gaston V., 1960. Reginald Henry Hargrove Professor of Economics and Associate of Lovett College
B.A. (1951) University of Washington; Ph.D. (1956) University of California, Berkeley

Robert, Mark A. 1984. Assistant Professor of Chemical Engineering
Dip. (1975) Swiss Federal Institute of Technology, Zurich; Ph.D. (1980) Swiss Federal Institute of Technology, Lusanne

Roberts, Jabus B., Jr., 1975. Professor of Physics
B.A. (1965) Columbia University; Ph.D. (1969) University of Pennsylvania

Roberts, John M., 1959. Professor of Materials Science and Associate of Hanszen College
B.A.Sc. (1953), M.A.Sc. (1954) University of Toronto, Canada; Ph.D. (1960) University of Pennsylvania

Robinson, Edward, 1985. Adjunct Professor of Geology and Geophysics
B.Sc. (1956) Birmingham University, England; Ph.D. (1969) University of London

Rorschach, Harold E., 1952. Sam and Helen Worden Professor of Physics and Associate of Will Rice College
S.B. (1949), S.M. (1950), Ph.D. (1952) Massachusetts Institute of Technology

Rosborough, James W., 1983. Adjunct Associate Professor of Administrative Science
B.S. (1958) Cornell University; M.B.A. (1970) Drexel University

Rose, Beatrice S., 1977. Lecturer on Music, Harp

Ross, David, III, 1979. Lecturer on Administrative Science
B.A. (1962) Yale University; M.B.A. (1970) Harvard University

Rudolph, Frederick B., 1972. Professor of Biochemistry
B.S. (1966) University of Missouri; Ph.D. (1971) Iowa State University

Rupp, George, 1985. President and Professor of Religious Studies
A.B. (1964) Princeton University; B.D. (1967) Yale University; Ph.D. (1972) Harvard University

Samuels, Danny M., 1981. Visiting Associate Professor of Architecture
B.Arch. (1971) Rice University

San, Ka-Yiu, 1984. Assistant Professor of Chemical Engineering
B.S. (1978) Rice; Ph.D. (1984) California Institute of Technology

Sanborn, Hugh W., 1973. Adjunct Assistant Professor of Religious Studies
A.B. (1962) Muhlenberg College; B.D. (1967) Andover Newton Theological Seminary; Ph.D. (1975) University of Iowa

Sanders, Susan M., 1985. Instructor of Human Performance and Health Services
B.A. (1973) Sam Houston State University; M.A. (1977) Sam Houston State University

Sass, Ronald L., 1958. Professor of Biology and Chemistry, Honorary Associate of Hanszen College, and Associate of Jones College
A.B. (1954) Augustana College; Ph.D. (1957) University of Southern California

Sauerbrey, Roland, 1985. Assistant Professor of Electrical and Computer Engineering
Dip. (1978); Ph.D. (1981) University Wuerzburg, West Germany

Schaezler, Donald J., 1979. Adjunct Associate Professor in the Department of Environmental Science and Engineering and Adjunct Associate Professor in the Department of Chemical Engineering
B.A. (1966), B.S. (1967), Ph.D. (1970) Rice University

Schnoebelen, Anne, 1974. Professor of Music B.A. (1958) Rosary College; M.Mus. (1960), Ph.D. (1966) University of Illinois

Schreiber, B. Charlotte, 1983. Adjunct Professor of Geology
A.B. (1953) Washington University; M.S. (1966) Rutgers University; Ph.D. (1974) Rensselaer Polytechnic Institute

Schreiber, Janet M., 1976. Adjunct Associate Professor of Anthropology
B.A. (1968) University of California, Los Angeles; M.A. (1970), Ph.D. (1973) University of California, Berkeley

Schroder, G.D., 1979. Adjunct Associate Professor of Biology
B.A. (1967), M.A. (1970) Rice University; Ph.D. (1974) University of New Mexico

Schroepfer, George J., Jr., 1972. Ralph and Dorothy Looney Professor of Biochemistry and Chemistry
B.S. (1955), M.D. (1957), Ph.D. (1961) University of Minnesota

Schwarzer, Rudy R., 1974. Adjunct Associate Professor of Geology and Geophysics
B.S. (1963), M.S. (1966), Ph.D. (1969) Rensselaer Polytechnic Institute

Scott, David W., 1979. Professor of Mathematical Sciences
B.A. (1972), M.A., Ph.D. (1976) Rice University

Sears, David A., 1983. Adjunct Professor in Biomedical Engineering
B.S. (1953) Yale University; M.S. (1958), M.D. (1959) University of Portland Medical School

Seed, Patricia, 1982. Associate Professor of History B.A. (1971) Fordham University; M.A. (1975) University of Texas; Ph.D. (1980) University of Wisconsin

Sellers, James, 1971. David Rice Professor of Ethics
B.E.E. (1947) Georgia Institute of Technology; M.S. (1952) Florida State University; Ph.D. (1958) Vanderbilt University

Semmes, Stephen W., 1987. Professor of Mathematics
B.S. (1980) Armstrong State College; Ph.D. (1983) Washington University

Seriff, Aaron J. 1982. Adjunct Professor of Geology and and Geophysics and Associate of Hanszen College
B.S. (1944), M.A. (1946) University of Texas; Ph.D. (1951) California Institute of Technology

Shalen, Peter B., 1974. Adjunct Professor of Mathematics
B.A. (1966), Ph.D. (1972) Harvard University

Shank, C. Dean, Jr. 1984. Artist Teacher of Secondary Piano and Piano Technology
B.Mus. (1968), M.Mus. (1971) North Texas State University

Sherman, William H., 1986. Assistant Professor of Architecture
A.B. (1977) Princeton University; M.Arch. (1982) Yale University

Shields, P. David, 1983. Assistant Professor of Accounting and of Brown College
B.A. (1971), M.B.A. (1974) Ohio State University; Ph.D. (1980) University of Michigan

Shmider, Edward, 1983. Associate Professor of Music
B.Mus. (1968) Mussorgsky Musical College, Leningrad, U.S.S.R.; M.Mus. (1975), Aspirant Diploma (1979) Gnesin Music Academy, Moscow, U.S.S.R.

Sickles, Robin, 1985. Professor of Economics
B.S. (1972) Georgia Institute of Technology; Ph.D. (1976) University of North Carolina, Chapel Hill

Sinclair, James B., 1978. Associate Professor of Computer Science in the Department of Computer and Electrical Engineering and Associate of Brown College
B.S.E.E. (1973), M.E.E. (1974), Ph.D. (1979) Rice University

Singer, Steven J., 1983. Adjunct Associate Professor of Accounting
B.S. (1969) New York University; J.D. (1973) Fordham University

Skaggs, Ray H., 1972. Adjunct Professor of Human Performance and Health Sciences
B.A. (1942) Rice Institute; M.D. (1945) University of Texas

Skura, Meredith, 1978. Professor of English
B.A. (1965) Swarthmore College; Ph.D. (1971) Yale University

Slayton, Barney F., 1987. Lt. Colonel U.S. Army and Adjunct Professor of Military Science
B.A. (1967) Sam Houston State University; M.A. (1980) University of Kansas

Smalley, Richard E., 1976. Norman and Gene Hackerman Professor of Chemistry
B.S. (1965) University of Michigan; M.A. (1971), Ph.D. (1973) Princeton University

Smith, David P., 1982. Adjunct Assistant Professor of Sociology
B.A. (1962) University of California, Los Angeles; Ph.D. (1979) Harvard University

Smith, George, 1981. Associate Professor of Art
B.F.A. (1969) San Francisco Art Institute; M.A. (1972) Hunter College

Smith, Gordon W., 1968. Professor of Economics
University; Ph.D. (1966) Harvard University

Smith, Richard J., 1973. Professor of History and Master of Hanszen College
B.A. (1965), M.A. (1968), Ph.D. (1972) University of California, Davis

Smith, V.C., 1979. Adjunct Associate Professor in the Department of Chemical Engineering
B.S. (1967), M.S. (1968) Oklahoma State University

Snow, Edward A., 1981. Professor of English and Associate of Hanszen College
B.A. (1964) Rice University; M.A. (1966) University of California, Riverside; Ph.D. (1969) State University of New York, Buffalo

Soligo, Ronald, 1967. Professor of Economics
B.A. (1958) University of British Columbia, Canada; Ph.D. (1964) Yale University

Solis, R. Thomas, 1979. Adjunct Associate Professor in the Biomedical Engineering Laboratory
B.A. (1960) Texas A&M University; M.A. (1962) Oxford University; M.D. (1965) Yale University

Sonntag, Christopher H., 1987. Captain of U.S. Navy and Visiting Assistant Professor
B.A. (1978) Marquette University; M.S. (1986) University of Southern California

Spanos, Pol D., 1984. Professor of Mechanical Engineering and Civil Engineering
Dip. (1973) National Technical University (Greece); M.S. (1974); Ph.D. (1976) California Institute of Technology

Spence, Dale W., 1963. Professor of Human Performance and Health Sciences
B.S. (1956) Rice Institute; M.S. (1959) North Texas State University; Ed.D. (1966) Louisiana State University

Sperling, Harry G., 1982. Adjunct Professor of Biology
A.B. (1944) University of Pennsylvania; M.S. (1946) New School, New York; Ph.D. (1953) Columbia University

Spivak, Michael D., 1984. Adjunct Professor of Mathematics
B.A. (1960) Harvard University; Ph.D. (1964) Princeton University

Stanton, R. John, Jr., 1983. Adjunct Professor of Administrative Science
B.A. (1962) Rice University; M.B.A. (1965) Harvard University

Stebbings, Ronald F., 1968. Professor of Space Physics and Astronomy and of Physics, Vice-President for Student Affairs and Associate of Jones College
B.Sc. (1952), Ph.D. (1956) University of London, England

Steenburgh, Frederick L., 1985. Commander, U.S. Navy, NROTC Executive Officer, Associate Professor of Naval Science
B.S. (1965) University of Rochester; M.B.A. (1976) Mississippi State University

Steffey, Marda N., 1984. Lecturer on Administrative Science
B.A. (1976) University of Houston; M.A. (1981), Ph.D. (1984) Rice University

Stein, Robert M., 1979. Associate Professor of Political Science and Associate of Hanszen College
(1974), Ph.D. (1977) University of Wisconsin at Milwaukee

Stevenson, Paul M., 1984. Assistant Professor of Physics
B.A. (1976) Cambridge; Ph.D. (1979) Imperial College, London

Stewart, Charles R., 1969. Professor of Biology and Associate of Jones College
B.S. (1962) University of Wisconsin; Ph.D. (1967) Stanford University

Stingl, Michael J., 1986. Assistant Professor of Philosophy
B.A. (1977) University of Wisconsin, Madison; M.A. (1978), Ph.D. (1986) University of Toronto

Stokes, Gale, 1968. Professor of History
B.A. (1954) Colgate University; M.A. (1965), Ph.D. (1970) Indiana University

Stoll, Richard J., 1979. Associate Professor of Political Science and Associate of Jones College
A.B. (1974) University of Rochester; Ph.D. (1979) University of Michigan

Stormer, John C., Jr., 1983. Croneis Professor of Geology
A.B. (1963) Dartmouth College; Ph.D. (1971) University of California, Berkeley

Stout, Janis, 1977. Lecturer on English
B.A. (1966), M.A. (1968) Lamar State University; Ph.D. (1973) Rice University

Strassmann, Diana 1983. Assistant Professor of Economics
A.B. (1977) Princeton University; M.A. (1982), Ph.D. (1983) Harvard University

Strassmann, Joan E., 1980. Associate Professor of Biology and Associate of Will Rice College
B.A. (1974) University of Michigan; Ph.D. (1979) University of Texas

Subtelny, Stephen, 1968. Professor of Biology and Associate of Brown College
B.A. (1949) Hobart College; M.A. (1952), Ph.D. (1955) University of Missouri

Sullivan, Kathryn D., 1985. Adjunct Assistant Professor in Geology and Geophysics
B.S. (1973) University of California, Santa Cruz; Ph.D. (1978) Dalhousie University, Halifax, Nova Scotia

Sullivan, Michael E., 1986. Captain, U.S. Navy and Professor of Naval Science
B.S. (1962) U.S. Naval Academy; M.S. (1971) Naval Postgraduate School

Swint, John Michael, 1977. Adjunct Associate Professor of Economics
B.A. (1968) California State University at Humboldt; M.A., Ph.D. (1972) Rice University

Symes, William W., 1984. Professor of Mathematical Sciences
B.A. (1971) University of California at Berkeley; M.A., Ph.D. (1975) Harvard University

Talwani, Manik, 1985. Schlumberger Professor of Geophysics
B.Sc.Hons. (1951), M.Sc.(1953) Delhi University; Ph.D. (1959) Columbia University; Ph.D. (Honoris Causa) (1981)Oslo University

Tapia, Richard A., 1970. Professor of Mathematical Sciences
B.A. (1961), M.A. (1966), Ph.D. (1967) University of California, Los Angeles

Taylor, Julie M., 1981. Associate Professor of Anthropology
B.A. (1966) Harvard University; Diploma (1969), D.Phil. (1974) University of Oxford

Taylor, Ronald N., 1983. George R. Brown Professor of Administration, Professor of Psychology and Associate of Baker College
B.A. (1960) Westminster College; M.A. (1964) University of Nebraska; Ph.D. (1970) University of University of Minnesota

Temkin, Larry S., 1983. Assistant Professor of Philosophy
B.A. (1975) University of Wisconsin; Ph.D. (1981) Princeton University

Thames, Howard D., Jr., 1975. Adjunct Professor of Statistics
B.A. (1963), Ph.D. (1970) Rice University

Thompson, Ewa M., 1970. Professor of Russian
B.A. (1963) University of Warsaw, Poland; M.F.A. (1963) Sopot Conservatory of Music, Poland; Ph.D. (1967) Vanderbilt University

Thompson, James R., 1970. Professor of Statistics and Associate of Lovett College
B.Eng. (1960) Vanderbilt University; M.A. (1963), Ph.D. (1965) Princeton University

Tittel, Frank K., 1967. Professor in the Department of Electrical and Computer Engineering and Associate of Hanszen College
B.A. (1955), M.A., Ph.D. (1959) Oxford University, England

Tobin, Mary L., 1979. Lecturer on English
B.A. (1963) Carleton College; M.A. (1966) Columbia University; Ph.D. (1973) Rice University

Todd, Anderson, 1949. Gus Sessions Wortham Professor in Architecture
B.A. (1943), M.F.A. (1949) Princeton University

Tomson, Mason B., 1977. Associate Professor of Environmental Science and Engineering
B.S. (1967) Southwestern State College; Ph.D. (1972) Oklahoma State University

Trammell, George T., 1961. Professor of Physics
B.A. (1944) Rice Institute; Ph.D. (1950) Cornell University

Traweek, Sharon, 1987. Associate Professor of Anthropology
B.A. (1964) University of California at Berkeley; M.A. (1966) California State University; Ph.D. (1982) University of California at Santa Cruz

Trepel, Shirley, 1975. Professor of Music
B.Mus. (1945) Curtis Institute of Music

Tsuchitani, Chiyeko, 1986. Adjunct Professor in the Department of Electrical and Computer Engineering
B.A. (1961) University of California, Berkeley; Ph.D. (1966) University of Louisville

Tucker, Kenneth H., Jr., 1986. Assistant Professor of Sociology and Associate of Lovett College
B.A. (1975), M.A. (1979), Ph.D. (1986) University of California, Berkeley

Tuggle, Francis D., 1978. Jesse H. Jones Professor of Management, Professor of Psychology, and Associate of Brown College
S.B. (1964) Massachusetts Institute of Technology; M.S. (1967), Ph.D. (1971) Carnegie-Mellon University

Tyler, Stephen A., 1970. Professor of Anthropology and Linguistics
B.A. (1957) Simpson College; M.A. (1962), Ph.D. (1964) Stanford University

Udden, Mark M., 1983. Adjunct Assistant Professor in the Biomedical Engineering Laboratory
M.A., S.B. (1973) Massachusetts Institute of Technology; M.D. (1977) Southwestern Medical School, University of Texas, Dallas

Uecker, Wilfred C., 1984. Harmon Whittington Professor of Accounting, Associate Dean for Academic Affairs of the Jesse H. Jones Graduate School of Administration, and Associate of Will Rice College
B.A. (1968), M.B.A. (1970), Ph.D. (1973) University of Texas at Austin

Ulrich, Roger B., 1984. Assistant Professor of Art and Art History and Resident Associate of Will Rice College
B.A. (1977) Dartmouth College; M.A. (1980), Ph.D. (1984) Yale University

Urrutibeheity, Hector N., 1967. Associate Professor of Spanish and Linguistics
Profesorado (1956) La Plata National University, Argentina; Ph.D. (1968) Stanford University

Vail, Peter R., 1986. W. Maurice Ewing Professor of Oceanography
A.B. (1952) Dartmouth College; M.S. (1953), Ph.D. (1959) Northwestern University

Valdivieso, Mercedes, 1973. Associate Professor of Spanish and Associate of Richardson College
Bachillerato (1946) University of Chile; M.A. (1969) University of Houston

Valkovic, Vlado, 1965. Adjunct Professor of Physics
B.A. (1961), M.A. (1963), Ph.D. (1964) University of Zagreb, Yugoslavia

Van Helden, Albert, 1970. Professor of History
B.Eng. (1962), M.S. (1964) Stevens Institute of Technology; M.A. (1967) University of Michigan; Ph.D. (1970) London University, England

Varman, Peter J. 1983. Assistant Professor of Computer Science in the Department of Electrical and Computer Engineering
B.Tech. (1978) Indian Institute of Technology, Kanpur; M.S.E.E. (1980); Ph.D. (1983) University of Texas, Austin

Veech, William A., 1969. Professor of Mathematics
A.B. (1960) Dartmouth College; Ph.D. (1963) Princeton University

Veletsos, Anestis S., 1964. Brown and Root Professor, Department of Civil Engineering
B.S. (1948) Robert College, Turkey; M.S. (1950), Ph.D. (1953) University of Illinois

Viebig, V. Richard, Jr., 1969. Lecturer on Accounting
B.A. (1962), Master of Accounting (1977) Rice University

Visser, Pieter A., 1979. Adjunct Lecturer on Music

von der Mehden, Fred R., 1968. Albert Thomas Professor of Political Science, Professor of Administrative Science and Associate of Lovett College
B.A. (1948) University of the Pacific; M.A. (1950) Claremont Graduate School; Ph.D. (1957) University of California, Berkeley

Waldman, Peter D., 1981. Associate Professor of Architecture and Associate of Wiess College and Master of Hanszen College (eff. 1/1/88)
B.A. (1965), M.F.A. (1967) Princeton University

Walker, James B., 1964. Professor of Biochemistry
B.S. (1943) Rice Institute; M.A. (1949), Ph.D. (1952) University of Texas

Walker, William F., 1965. Professor of Mechanical Engineering and Mathematical Sciences and Associate of Wiess College
B.S. (1960), M.S. (1961) University of Texas; Ph.D. (1966) Oklahoma State University

Wallace, Kristine Gilmartin, 1966. Associate Professor of Classics
B.A. (1963) Bryn Mawr College; M.A.(1965), Ph.D. (1967) Stanford

Walp, Robert, 1983. Artist Teacher of Trombone and Resident Associate of Lovett College
B.Mus. (1982) Northwestern University

Walters, G. King, 1963. Professor of Physics and of Space Physics and Astronomy
B.A. (1953) Rice Institute; Ph.D. (1956) Duke University

Wang, Chao-Cheng, 1968. Noah Harding Professor of Mathematical Sciences and Professor of Mechanical Engineering
B.S. (1959) National Taiwan University; Ph.D. (1965) Johns Hopkins University

Ward, Calvin H., 1966. Professor of Biology and Environmental Science
B.S. (1955) New Mexico State University; M.S. (1958), Ph.D. (1960) Cornell University; M.P.H. (1978) University of Texas School of Public Health

Ward, Joseph A., Jr., 1964. Professor of English
A.B. (1952) University of Notre Dame; M.A. (1954), Ph.D. (1957) Tulane University

Warren, Joe D., 1986. Assistant Professor of Computer Science
B.A. (1983), M.S. (1985) Rice University; Ph.D. (1986) Cornell University

Warren, Paul R., 1986. Visiting Instructor of Philosophy
B.A. (1979) Alfred University; M.A. (1984) University of Wisconsin-Madison

Warren, Scott K., 1979. Adjunct Assistant Professor of Computer Science
B.A. (1972), M.A. (1974), Ph.D. (1976) Rice University

Waters, C. Kenneth, 1987. Assistant Professor of Philosophy
B.A. (1979) University of Vermont; M.A. (1984) Ph.D. (1985) Indiana University

Waters, David L., 1976. Artist Teacher of Trombone
B.M.E. (1962) University of Houston; M.Mus. (1964) University of Texas

Watkins, Joel S., 1986. Adjunct Professor of Geology and Geophysics
A.B. (1953) University of North Carolina at Chapel Hill; Ph.D. (1961)University of Texas at Austin

Watkins, Michael J., 1980. Professor of Psychology
B.Sc. (1965, 1969), Ph.D. (1972) University of London, England

Weinberg, Armin D., 1980. Adjunct Professor of Human Performance and Health Sciences
B.A. (1966), Ph.D. (1971) Ohio State

Weisman, R. Bruce, 1979. Associate Professor of Chemistry
B.A. (1971) Johns Hopkins University; Ph.D. (1977)

Weissenberger, Klaus H.M., 1971. Professor of German
B.A. (1959), M.A. (1965) University of Hamburg, Germany; Ph.D. (1967) University of Southern California

Wells, Raymond O., Jr., 1965. Professor of Mathematics
B.A. (1962) Rice University; M.S. (1964), Ph.D. (1965) New York University

Westheimer, Alan D., 1983. Lecturer on Accounting
B.S.E. (1965) University of Pennsylvania; M.B.A. (1966) University of California, Berkeley

Wheeler, Mary Fanett, 1974. Professor of Mathematical Sciences
B.A., B.S. (1960), M.A. (1963) University of Texas; Ph.D. (1971) Rice University

White, Frank S., 1982. Lecturer on Architecture
B.S. (1977) Rochester Institute of Technology

White, Robert A., 1981. Adjunct Associate Professor of Statistics
B.A. (1966) New Mexico State University; Ph.D. (1970) University of Chicago

Whitmire, Kenton H., 1982. Assistant Professor of Chemistry
B.S. (1977) Roanoke College; Ph.D. (1982) Northwestern University

Widrig, Walter M., 1969. Associate Professor of Art History and Associate of Richardson College
B.A. (1951) Yale University; M.A. (1956) Columbia University; Ph.D. (1975) New York University

Wiener, Martin J., 1967. Mary Gibbs Jones Professor of History
B.A. (1962) Brandeis University; M.A. (1963), Ph.D. (1967) Harvard University

Wierum, Frederic Atherton, Jr., 1961. Professor of Mechanical and Aerospace Engineering
B.S.M.E. (1955) Wichita State University; M.S.M.E. (1959) University of Houston; Ph.D. (1962) Rice University

Wilford, Michael, 1978. Visiting Professor of Architecture
Honors Diploma (1960) Northern Polytechnic School of Architecture, England; Diploma (1967) Regent Street Polytechnic Planning School

Willcott, M. Robert, III, 1981. Adjunct Professor of Chemistry
B.A. (1955) Rice Institute; M.S. (1959), Ph.D. (1963) Yale University

Williams, Edward E., 1978. Henry Gardiner Symonds Professor of Administrative Science and Associate of Richardson College
B.S. (1966) University of Pennsylvania; Ph.D. (1968) University of Texas

Wilson, James L., 1966. Adjunct Professor of Geology and Geophysics
B.A. (1942), M.A. (1944) University of Texas; Ph.D. (1949) Yale University

Wilson, John T. 1980. Adjunct Associate Professor of Environmental Science and Engineering
B.S. (1969) Baylor University; M.A. (1971) University of California, Berkeley; Ph.D. (1978) Cornell University

Wilson, Joseph B., 1954. Professor of German
B.A. (1950), M.A. (1953) Rice Institute; Ph.D. (1960) Stanford University

Wilson, Lon J., 1973. Professor of Chemistry and Associate of Richardson College
B.A. (1966) Iowa State University; Ph.D. (1971)

Wilson, Richard L., 1985. Assistant Professor of Art History
B.A. (1981) Franklin and Marshall College; M.A. (1981), Ph.D. (1985) University of Kansas

Wilson, Rick K., 1983. Assistant Professor of Political Science
B.A. (1975), M.A. (1977) Creighton University; Ph.D. (1982) Indiana University

Wilson, William L. Jr., 1972. Professor in the Department of Electrical and Computer Engineering and Resident Associate of Wiess College
B.S. (1965), M.S. (1966), Ph.D. (1972) Cornell University

Wilson, William R., 1985. Assistant Professor of Administrative Science and Associate of Jones College
B.S. (1968) Eastern Michigan University; M.B.A. (1985) University of Texas at Austin; M.A. (1970), Ph.D. (1975) University of Michigan

Windsor, Duane, 1977. Associate Professor of Administrative Science, and Associate Dean for Student Affairs of the Jesse H. Jones Graduate School of Administration, and Associate of Will Rice College
B.A. (1969) Rice University; A.M. (1973), Ph.D. (1978) Harvard University
University

Winkler, Michael, 1967. Professor of German and Associate of Richardson College
B.A. (1961) St. Benedict's College; M.A. (1963), Ph.D. (1966) University of Colorado

Winningham, Geoffrey L., 1969. Professor of Art and Honorary Associate of Wiess College
B.A. (1965) Rice University; M.S. (1968) Illinois Institute of Technology

Wisoff, Peter Jeffrey K., 1987. Assistant Professor in Electrical and Computer Engineering
B.S. (1980) University of Virginia; M.S. (1982), Ph.D. (1986) Stanford University

Wittenberg, Gordon G., Jr., 1979. Associate Professor of Architecture and Associate of Richardson College
B.F.A. (1968) Trinity College, Connecticut; M.Arch. (1972) Washington University

Wolf, Richard A., 1967. Professor of Space Physics and Astronomy
B.Eng.Phys. (1962) Cornell University; Ph.D. (1966) California Institute of Technology

Wolin, Richard, 1984. Associate Professor of History
B.A. (1974) Reed College; M.A. (1976), Ph.D. (1980) York University

Wood, Susan, 1981. Assistant Professor of English
B.A. (1968) East Texas State University; M.A. (1970) University of Texas, Arlington

Wright, Anthony A., 1980. Adjunct Associate Professor of Psychology
B.A. (1965) Stanford University; M.A. (1970), Ph.D. (1971) Columbia University

Wu, Kenneth K. 1984. Adjunct Professor in the Biomedical Engineering Laboratory
M.D. (1966) National Taiwan University; M.S. (1968) Yale

Wunder, R. Stephen, 1984. Adjunct Assistant Professor of Psychology
B.A. (1970) Creighton University, M.A. (1976), Ph.D. (1979) Wayne State University

Yamal, Ricardo, 1986. Assistant Professor of Spanish
B.A. (1979) Universidad Catolica, Chile; M.A. (1978), Ph.D. (1982) University of Pittsburgh

Yang, Deane, 1983. Assistant Professor of Mathematics
B.A. (1979) University of Pennsylvania; Ph.D. (1983) Harvard University

Yatsu, Frank M., 1984. Adjunct Professor in the Biomedical Engineering Laboratory
A.B. (1955) Brown University; M.D. (1959) Case-Western Reserve University

Young, Richard D., 1965. Professor of Economics and Mathematical Sciences
B.A. (1951), M.A. (1954) University of Minnesota; Ph.D. (1965) Carnegie Institute of Technology

Yunis, Harvey E., 1987. Assistant Professor of Ancient Studies
B.A. (1978) Dartmouth College; B.A. (1982) M.A. (1985) University of Cambridge

Zdatny, Steven, 1986. Floyd Seward Lear Lecturer on History
B.A. (1972), M.A. (1974) State University of New York at Buffalo; Ph.D. (1982) University of Pennsylvania

Zeff, Stephen A., 1978. Herbert S. Autrey Professor of Accounting and Associate of Richardson College
B.S. (1955), M.S. (1957) University of Colorado; M.B.A. (1960), Ph.D. (1962) University of Michigan

Zimmerman, Stuart D., 1971. Adjunct Professor of Statistics
B.A. (1955), Ph.D. (1961) University of Chicago

Zodrow, George, 1979. Associate Professor of Economics and Associate of Lovett College
B.A., M.M.E. (12973) Rice University; M.A. (1977) Ph.D. (1980) Princeton University

Zwaenepoel, Willy E., 1984. Assistant Professor of Computer Science
B.S. (1979) Ghent, Belgium; M.S. (1980), Ph.D. (1984) Stanford

Zygourakis, Kyriacos, 1980. Associate Professor in the Department of Chemical Engineering
Diploma of Chemical Engineering (1975) National Technical University of Athens; Ph.D. (1981) University of Minnesota

Professional Research Staff

Buchanan, J.A., 1961. Senior Research Scientist in Physics
B.S. (1970) University of Houston

Chu, Arthur J., 1984. Research Scientist in Biochemistry
B.S. (1974) Chung-Yuang University, Taiwan; Ph.D. (1981) University of Nevada

Clement, J.M., Jr. 1974. Research Scientist in Physics
B.S. (1965), M.S. (1966) Cornell University; Ph.D. (1972)Renssalaer Polytechnic Institute

Gibson, Bruce S., 1984. Research Scientist in Geology and Geophysics
B.A. (1973) Pomona College; M.S. (1975) University of Hawaii

Hauge, R.H., 1967. Research Scientist in Chemistry
B.A. (1960) Loras College; Ph.D. (1965) University of California at Berkeley

Hill, Thomas W., 1976. Senior Research Scientist in the Center for Space Physics and Astronomy
B.A. (1967), M.S. (1971), Ph.D. (1973) Rice University

Hinterberger, Henry, 1985. Senior Research Scientist in Physics
B.S.M.E. (1948) City College of New York

Kisic, A., 1973. Senior Research Scientist and Departmental Administrator in Biochemistry
B.S. (1954), Ph.D. (1961) University of Zagreb, Yugoslavia

Kook, Alan Mark, 1985. NMR Manager in Chemistry
B.S. (1974) SUNY at Stonybrook; Ph.D. (1984) University of Kentucky

Ledley, Tamara A.S., 1985. Assistant Research Scientist in the Center for Space Physics and Astronomy
B.S. (1976) University of Maryland; Ph.D. (1983) Massachusetts Institute of Technology

Mann, Thomas, 1985. Senior Research Engineer in Physics
B.M.E. (1965) Georgia Institute of Technology

Marriott, Terry D., 1978. Scientist and Instrument Manager in Chemistry
B.S. (1969), Ph.D. (1976) Oklahoma State University

Menefee, Richard F., 1980. Research Scientist in Chemistry

Napier, H. Albert, 1983. Senior Research Associate in the Jones Graduate School of Administration
B.A. (1966), M.B.A. (1968), Ph.D. (1971) University of Texas

Nelson, Stephen O., 1984. Research Scientist in Biochemistry
B.S. (1967), M.S. (1970) Northeast Louisiana State University; Ph.D. (1974) Texas A&M University; Ph.D. (1980) University of Amsterdam

Pelley, Ronald P., 1985. Research Scientist in Biochemistry
B.S. (1968) Michigan State University; Ph.D. (1975), M.D. (1976) Case Western Reserve University

Pinkerton, Frederick D., 1984. Senior Research Scientist in Biochemistry
B.S. (1969) Eastern Montana College; Ph.D. (1976) Montana State University

Pyrek, Jan S., 1984. Research Scientist in Biochemistry
M.S. (1965) Warsaw University, Poland; Ph.D. (1971) Polish Academy of Sciences

Reiff, Patricia H., 1976. Senior Research Scientist in the Center for Space Physics and Astronomy and University Associate of Jones College
B.S. (1971) Oklahoma State University; M.S. (1974), Ph.D. (1975) Rice University

Smith, Ken A., 1984. Executive Director of the Rice Quantum Institute and Associate Research Scientist in the Center for Space Physics and Astronomy
B.S. (1958) University of Southern California; M.S. (1973) Rice University; Ph.D. (1975) Rice University

Smith, Wayne A., 1966. Contracts and Administrative Manager in Space Physics and Astronomy
B.S.E.E. (1958) University of Southern California

Spiro, Robert W., 1978. Research Scientist III in Space Physics and Astronomy
B.A. (1968) University of Dallas; Ph.D. (1978) University of Texas—Dallas

Vermilion, Janice L., 1979. Senior Research Scientist in Biochemistry
B.S. (1971) University of Illinois; Ph.D. (1976) University of Michigan

Voigt, Gerd-Hannes, 1980. Senior Research Scientist in the Center for Space Physics and Astronomy
Diploma of Physics and Geophysics (1970), Ph.D. (1975) University of Braunshweig, Germany

Wang, Tong, 1985. Senior Research Associate in Mechanical Engineering
Ph.D. (1985) Rice University
Watkins, Olga C., 1980. Research Associate in Psychology
B.A. (1971), Ph.D. (1977) University of London, England
Wilson, William K., 1982. Research Scientist in Biochemistry
B.A. (1970) Earlham College; Ph.D. (1982) University of New Mexico
Wise, J.D., 1978. Research Engineer in Electrical Engineering
B.A. (1970). M.E.E. (1971), Ph.D. (1977) Rice University

Program Development Staff

Continuing Studies and Special Programs

Burgess, Katherine L., 1987. Assistant to the Director of Language Programs
M.A. (1977) University of Florida
Carlson, Edith, 1978. Director of Programs
B.S. (1976) Georgia Tech
Hsu, Laura, 1980. Director of Programs
Ph.D. (1980) University of Miami
McIntire, Mary. Dean
Ph.D. (1975) Rice University
Sayers-Olivares, Kathleen, 1983. Director of Language Programs
Ph.D. (1981) University of Texas

Professional Staff of the Library

Adler, Marianne G., 1974. Director, Division of Processing Services
B.A. (1973) Rice University; M.L.S. (1974) University of Texas; M.A. (1977) Rice University
Baber, Elizabeth Ann, 1965. Data Base Management Librarian
B.A. (1960) Rice University; M.L.S. (1961) University of California at Berkeley
Baghal-Kar, Vali, 1984. Interlibrary Loan Librarian
B.A. (1969) University of Firdowsi, Iran; M.L.S. (1975) University of Teheran, Iran; M.A. (1979), Ph.D. (1981) Bowling Green State University
Boothe, Nancy L., 1965. Director of the Woodson Research Center and University Associate of Brown College
B.A. (1952) Rice Institute; M.S.L.S. (1965) Catholic University of America; M.A. (12979) Rice University
Carrington, Samuel M., Jr. 1967. Professor of French, University Librarian, University Associate of Jones College
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina
Caswell, Jean L., 1986. Automation Librarian
B.A. (1974) New Mexico Institute of Mining and Technology
M.A.L.S. (1976) Northern Illinois University
Charles, Elizabeth D., 1983. Executive Director, Friends of Fondren
B.A. (1963) University of Texas
Edwards, Sandra E., 1985. Humanities Librarian
B.A. (1980) Grinnell College; M.A. (1982), M.A.L.S. (1984) University of Missouri

Flowers, Kay A., 1978. Assistant University Librarian for Automated Services
B.A. (1977) Rice University; M.S.L.S. (1984) University of Illinois

Ford, Margaret C., 1979. Information Librarian
B.A. (1979) Florida Atlantic University; M.L.I.S. (1984) University of Texas

Fry, Michael F., 1986. Manuscript Librarian
B.A. (1977) Westminster College; M.A. (1979) Tulane University

Gourlay, Una M., 1986. Director, Division of Community Services
B.Sc. (1958) University of Glasgow

Holibaugh, Ralph W., 1975. Associate University Librarian
B.A. (1964) University of Cincinnati; M.A. (1970) Kent State University; M.S.L.S. (1975) University of Illinois

Hunter, John H., 1979. Reference/Collection Development Librarian
B.S. (1971) Wiley College; M.L.S. (1974) Indiana University

Hyman, Ferne B., 1968. Assistant University Librarian for Collection Management and University Associate of Baker College
B.A. (1948) University of California at Los Angeles; M.A. (1969) Loyola University of Los Angeles; M.S.L.S. (1969) University of Illinois

Keck, Kerry A., 1985. Government Publications Librarian
B.A. (1980) University of Colorado; M.S.L.S. (1982) University of Illinois

Kile, Barbara, 1971. Director, Division of Government Publications and Special Resources
B.A. (1967), M.S.L.S. (1968) University of Illinois

Kuo, Jiun-Huei Chern, 1985. Catalog Librarian
B.A. (1978) National Taiwan University; A.M.L.S. (1982) University of Michigan

Marsales, Rita, 1973. Catalog Maintenance Librarian
B.A. (1957) Louisiana State University; M.L.S. (1973) University of Texas

Perrine, Richard H., 1960. Assistant University Librarian for Planning, Head of Reference/Collection Development Services, Adjunct Associate Professor of Architecture, Emeritus
B.F.A. (1940) Yale University; M.L.S. (1961) University of Texas; B.A. (1977) Washington University; M.A.L.S. (1981) University of Missouri

Prendeville, Jet Marie, 1979. Reference/Collection Development Librarian and Art and Architecture Librarian
B.A. (1972) Memphis State University; M.A. (1975) University of Michigan; M.S.L.S. (1979) University of Illinois

Redmon, Alice Jane, 1962. Special Processing Librarian Emerita
B.A. (1937) University of Denver

Robnett, William E., 1982. Director, Division of Reader Services
B.S. (1971), M.S. (1973) Texas Tech University; M.L.S. (1980) University of Texas

Schwartz, Charles A., 1987. Social Sciences Librarian
B.A. (1968) Denison University, Ph.D. (1972) University of Virginia, M.L.S. (1985) Indiana University.

Shaw, Peggy A., 1986. Business Librarian
B.A. (1970), B.S. (1972) Louisiana State University; M.L.S. (1982) North Texas State University

Silversteen, Sophy, 1965. Head of Serials
B.A. (1952) Rice Institute; M.S.S.W. (1954), M.L.S. (1965) University of Texas

Sudenga, Sara, 1985. Pure and Applied Sciences Librarian
B.A. (1984) Carleton College; M.A.L.S. (1985) University of Iowa

Wenner, Sandra, 1985. Music Librarian
B.Mus. (1981) Texas Christian University; M.A. (1984) University of North Carolina at Chapel Hill; M.A.L.S. (1984) University of Wisconsin

Wetzel, Shirley, 1983. Cataloging Librarian
A.A. (1960) Navarro College, B.A. (1968) Texas Technological College; M.A. (1980) Rice University

Professional Staff of the Institute for Computer Services and Applications

Case, John E., 1984. Programmer/Analyst
B.S. (1983) University of Houston
Fields, Corinne V., 1968. Manager of Programming and Data Control
B.B.A. (Southern Methodist University)
Garcia, Raymond A., 1979. Programmer/Analyst
Goodman, Sara L., 1979. Systems Programmer
B.S. (1965) Brooklyn College
Haengg, Sara.
B.S. (1984) University of California, Berkeley
Huston, Priscilla Jane, 1969. Director
B.A. (1964) Mount Holyoke College
Kittrell, Aubery.
B.A. (1974) University of West Florida
Martin, Andrea M., 1979. Manager, Resource Center
B.S.E.E. (1979), M.Mus. (1984) Rice University
McKinin, Katherine, 1985. Resource Center Consultant
B.A. (1976), M.A. (1978) Indiana University; M.B.A. (1983) University of Missouri
Naman, John L., 1985. Systems Programmer
B.A. (1974) Rice University
Rao, Luke C., 1985. Programmer/Analyst
Richard, Charles A., 1973. Manager, Operations
Richardson, J.R., 1985. Resource Center Consultant
B.S.C.E. (1974), M.Ch.E. (1974), M.B.A. (1986) Rice University
Schafer, Richard A., 1974. Manager Systems Support
B.A. (1973) M.A.M.S. (1974) Rice University
Williamson, Mark R., 1971. Assistant to the Director for Technical Affairs

Staff of the Health Service

Backes, Susan, M.D., 1985. Codirector, Counseling and Psychiatric Service
B.S. (1972) University of Southwestern Louisiana; M.D. (1979) Louisiana State University
Deen, L. Stanley, M.D., 1982. Codirector, Counseling and Psychiatric Service
B.A. (1974), M.D. (1978) University of Alabama
Fullen, Dollie, L.V.N., 1959. Nurse
McCulloch, Ann, 1985. Nurse
Medford, Pam, 1985. Nurse
Novak, Dain, M.D., 1981. Codirector of the Student Health Service
M.B.B.Ch. (1969) University of Witwatersrand, South Africa
Schnee, Amanda M., M.D., 1981. Codirector of the Student Health Service
M.B., Ch.B. (1968) St. Andrews University, Scotland

Staff of the Athletic Department

Berndt, Jerry L., 1986. Director of Athletics and Head Football Coach
B.S. (1962) Bowling Green State University; M.S. (1969) University of Toledo

Blankenship, D. Paul, 1980. Women's Tennis Coach
B.A. (1972) Texas Christian University

Butler, James E., M.D., 1977. Chief Team Physician
B.S. (1956) Sewanee College; M.A. (1957) Southwest Texas State; M.D. (1962) University of Texas

Castaneda, James A., 1961. Faculty Representative and Golf Coach
B.A. (1954) Drew University; M.A. (1955) Yale University; Ph.D. (1958) Yale University

Cousins, William A., 1983. Sports Information Director
B.S. (1971) New Mexico State

Eggert, Allen, 1968. Head Athletic Trainer
B.S. (1963) Rice University; M.A. (1967) California Western University

Hall, David H., 1980. Head Baseball Coach
B.S. (1971) University of Texas

Harris, James E., 1986. Assistant Athletic Director/Development
B.S. (1971) Bowling Green State University

Hawthorne, Martha E., 1979. Assistant Athletic Director for Women
B.A. (1960), B.S. (1961), M.S. (1964) Louisiana State University

Irish, William M., 1985. Director of Marketing
B.A. (1976) University of St. Thomas

Irwin, Keith, 1983. Weight and Strength Coach
B.S. (1979) Fort Hays State University

Keating, Tim, 1986. Recruiting Coordinator
B.A. (1975) Bethany College; M.A. (1981) DePauw University

Lopez, Victor M., 1980. Women's Track and Field Coach
B.S. (1971) University of Houston; M.S. (1975) Texas Southern University

May, John Robert, 1967. Associate Athletic Director
B.S. (1965) Rice University

Moniaci, Steve, 1980. Assistant Athletic Director for Operations
B.S. (1975) Ball State University; M.S. (1976) Ohio University

Scheid, Mark, 1984. Academic Advisor for Student Athletes
B.A. (1967), Ph.D. (1972) Rice University

Sokol, Debra L., 1980. Head Volleyball Coach
B.A. (1980) University of Houston

Steele, David B., 1984. Athletic Business Manager
B.A. (1982) Rice University; M.A. (1984) Ohio University

Straub, Stephen M., 1974. Head Coach, Men's Track and Field
B.A. (1972) Rice University

Tucker, Linda G., 1978. Head Coach, Women's Basketball
B.S. (1969) Wayland Baptist University

Turville, Lawrence C., 1979. Men's Tennis Coach
B.S. (1971) Georgia Tech

Wingenroth, Kristin B., 1983. Swimming Coach
B.A. (1976) Rice University; M.Ed. (1983) University of Houston

University Standing Committees for 1987-88

The president is an ex officio member of all committees.

Committee on Admissions
Committee on Affirmative Action
Committee on Campus Safety
Committee of the College Masters
Committee on Community Affairs
Committee on Computers
Education Council
Committee on Examinations and Standing
Committee on Fringe Benefits
Faculty Council
Graduate Council
Committee on the Library
Committee on Public Lectures
Committee on Religious Activities
Research Council
Residential College Management Advisory Committee
Rice University Athletics Committee
Rice University Marshals
Rice University Press Review Board
ROTC Committee
Committee on Scholarships and Awards
Committee on Student Affairs
Committee on Student Financial Aid
Committee on Student Health
Committee on the Undergraduate Curriculum
Committee on Undergraduate Teaching
University Council
University Review Board

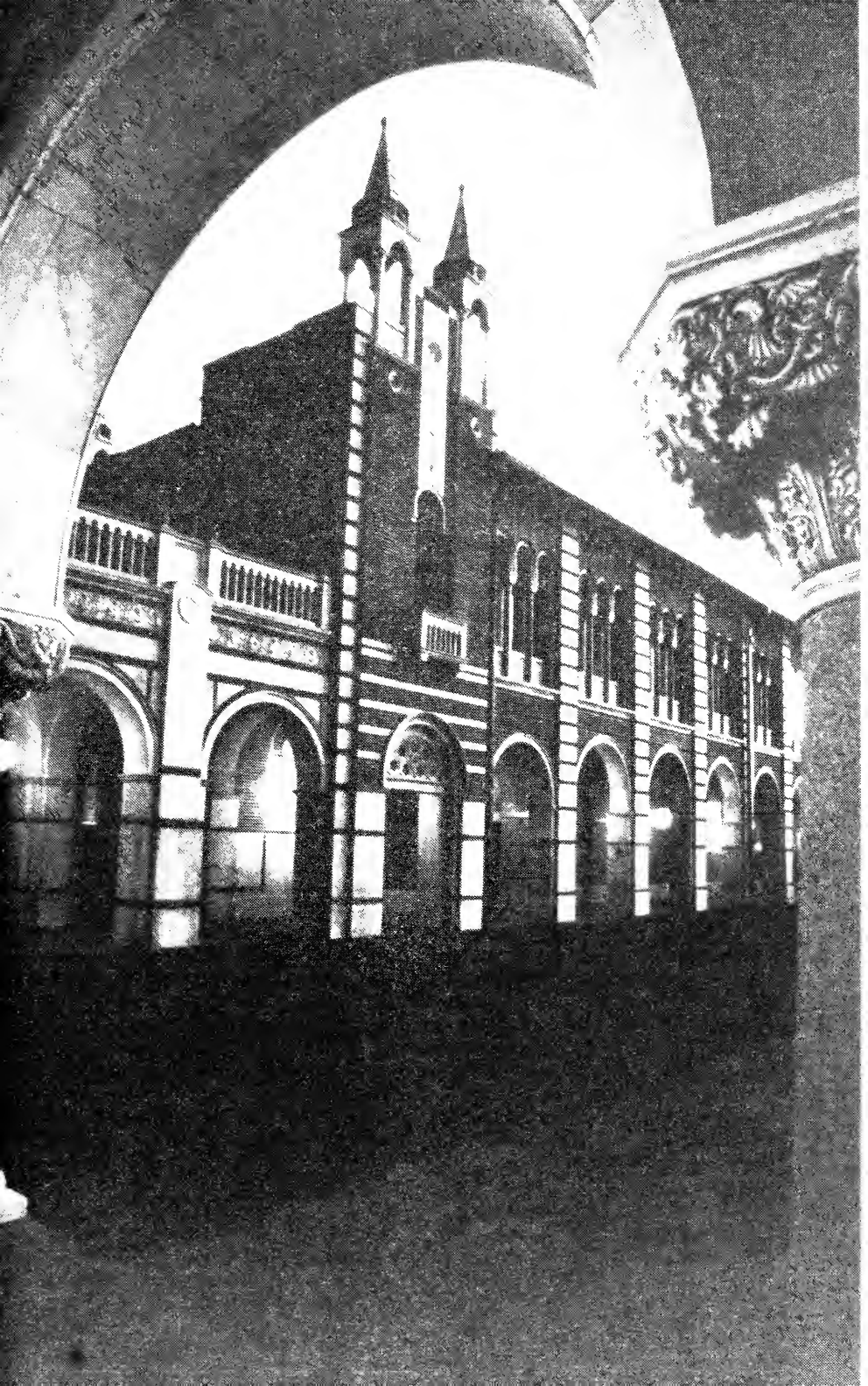
Chairs and Lectureships

Throughout its history, Rice University has been especially fortunate in the number of its friends and benefactors. Some of these are memorialized in the names of buildings and special physical facilities; others have generously provided for the enrichment of the University's intellectual life by establishing chairs and lectureships either on a temporary or permanent basis. Rice takes pleasure in recognizing on these pages some of these contributors to its academic excellence.

J. S. Abercrombie Chair in the School of Engineering
Agnes Cullen Arnold Chair in Humanities
Herbert S. Autrey Chair in Administration
Herbert S. Autrey Chair in Humanities
Lynette S. Autrey Chair in Humanities

Herbert S. Autrey Chairs in Social Sciences
Lynette S. Autrey Chair in Humanities — Music
Lynette S. Autrey Chair in Management
Brown and Root Chair in Engineering
George R. Brown Chair in Administration
Herman and George R. Brown Chair in Civil Engineering
Andrew Hays Buchanan Chairs in Astrophysics
D. R. Bullard — Welch Foundation Chair in Science
E. D. Butcher Chairs
Louis Calder Chair in Chemical Engineering
Harry S. Cameron Chair in Mechanical Engineering
Harry and Hazel Chavanne Chair in Religious Studies
Allyn R. and Gladys M. Cline Chair in Economics and Finance
Carey Croneis Chair in Geology
Craig Francis Cullinan Chair
G. C. Evans Instructorships in Mathematics
W. Maurice Ewing Chair in Oceanography
Laurence H. Favrot Chair in French
Henry S. Fox, Sr., Chair in Economics
Gladys Louise Fox Chair in English
Lena Gohlman Fox Chair in Political Science
Foyt Family Chair in Engineering
Gene and Norman Hackerman Chair in Chemistry
Noah Harding Chairs in Mathematics
Noah Harding Chair in Computer Science
Reginald Henry Hargrove Chair in Economics
A. J. Hartsook Chair in Chemical Engineering
William Pettus Hobby Chair in American History
Jesse H. Jones Chair in Management
Mary Gibbs Jones Chair in History
W. M. Keck Foundation Chair in Geophysics
William Alexander Kirkland Chair in Administration
Ralph and Dorothy Looney Chair
Edgar Odell Lovett Chair in Mathematics
Henry R. Luce Chair in Engineering Psychology
Samuel G. McCann Chair in History
Carolyn and Fred McManis Chair in Philosophy
Burton J. and Ann M. McMurtry Chair in the School of Engineering
Harris Masterson, Jr., Chair in History
Andrew W. Mellon Junior Humanities Scholars
Andrew W. Mellon Chair in the Humanities
Libbie Shearn Moody Chair in English
W. L. Moody, Jr., Chair in Mathematics
Stanley C. Moore Chair in Engineering
Joseph and Joanna Nazro Mullen Chair in Fine Arts
George A. Peterkin Chair in Political Economy
Milton B. Porter Chair in Mathematics
J. Newton Rayzor Chair in Philosophy and Religious Thought
Lewis B. Ryon Chair in Engineering
The Schlumberger Chair in Advanced Studies and Research
Elma Schneider Chair in Music
Harry K. and Albert K. Smith Chair in Architecture
Dorothy Richard Starling Chair in Classical Violin
Henry Gardiner Symonds Chair in Administration

Albert Thomas Chair in Political Science
Radoslav A. Tsanoff Chair in Public Affairs
William Gaines Twyman Chair in History
Isla and Percy Turner Chair in Biblical Studies
Robert A. Welch Chair in Chemistry
Harmon Whittington Chair in Administration
Harry Carothers Wiess Chair in Geology
Sam and Helen Worden Chair in Physics
Gus Sessions Wortham Chair in Architecture
Brown Foundation — J. Newton Rayzor Lectures
Carroll Camden Lectureship in English Literature
William Wayne Caudill Lecture Series in Architecture
English Department Distinguished Professor Lectureship
Joe L. Franklin Lectureship in Physical Chemistry
W. V. Houston Lectureship
Ervin Frederick Kalb Lectureship in History
Thomas W. Leland Visiting Lectureship in Chemical Engineering
The Rockwell Lectures
The Harold E. and Margaret R. Rorschach Memorial Lectures in Legal History
Tsanoff Lectureship in the Humanities
Dr. Thomas J. and Jane A. Vanzant Lectureship



Information for Undergraduate Students

Degree Requirements, Majors, and Curricula

All degrees conferred by Rice University, both graduate and undergraduate, are awarded solely in recognition of educational attainments, not as warranty of future employment or admission to other programs of higher education.

The Bachelor of Arts degree at Rice is awarded with a designated major in some field of architecture, the humanities, music, social sciences, science, engineering, or interdepartmental majors in managerial and policy studies. The general University requirements for the B.A. degree, as well as the options open to students in their choice of majors, are described below.

The Bachelor of Music is offered by the Shepherd School of Music. In addition, it is offered in conjunction with the Master of Music, both of which are awarded simultaneously on completion of a five-year program of professional studies.

The Jesse H. Jones Graduate School of Administration offers accelerated "five-year" master's degree plans in accounting and management which may be combined with any undergraduate major.

The various engineering departments also offer the Bachelor of Science degree which, like the B.A., normally requires four years for completion.

For students interested in teaching in secondary schools, a program of teacher training leading to state certification may be completed together with the B.A. degree. This program is administered by the Department of Education.

Programs that satisfy the requirements for admission to medical, dental, or law school are available in conjunction with the various majors.

Degree Requirements and Majors

Graduation and University Credit Requirements

Students completing a Bachelor of Arts degree must pass a minimum of 120 semester hours. In establishing an undergraduate major for the Bachelor of Arts degree, departments must specify a minimum of 18 semester hours for majors in the humanities and social sciences and a minimum of 24 semester hours for majors in science. No department may specify more than 80 semester hours (related laboratories, required courses, and prerequisites included). For a Bachelor of Arts degree in any discipline other than architecture students must pass a minimum of 60 semester hours in addition to major requirements specified by their department. Architecture majors must pass at least 38 semester hours in addition to their major requirements.

To fulfill the requirements for the degree of Bachelor of Science in one of the several branches of engineering, with the exception of chemical engineering, students must pass no fewer than 134 semester hours. Students fulfilling the requirements for the Bachelor of Science in chemical engineering must pass up to 137 semester hours, depending on accreditation requirements. In establishing a departmental major for the degree of Bachelor of Science in one of the various branches of engineering, with the exception of chemical engineering, no department may specify more than 92 semester hours (required courses, prerequisites, and related laboratories included). In establishing the departmental major for the B.S. in chemical engineering, the department may specify no more than the semester hours necessary to meet the requirements of the accrediting agency, up to a maximum total of 104 semester hours (required courses, prerequisites, and related laboratories included).

For either bachelor's degree, no fewer than 48 semester hours completed in fulfillment of the degree requirements must be on an advanced level (numbered 300 or higher) and more than 50 percent of these hours must be completed at Rice. Furthermore, students must complete more than 50 percent of the advanced level requirements in their major field at Rice. Within major requirements, departments may specify that a higher proportion of advanced level work must be taken at Rice.

After students have fulfilled University distribution requirements and the requirements for a designated major, all remaining courses in their degree programs are free electives.

To be recommended for graduation, all students must complete their degree requirements with a minimum GPA of 1.67 in all Rice courses and a minimum GPA of 2.00 for those courses presented in fulfillment of their major requirements. Students must be registered with the University in the semester immediately preceding the awarding of their degrees. Students who have completed their degree requirements in the summer or fall prior to that semester or who are completing their senior year at another college or university by special arrangement with the Committee on Examinations and Standing must register in order to be listed as degree candidates.

The Committee on Examinations and Standing reviews student records at the time of graduation and recommends to the faculty outstanding students to be granted degrees *cum laude, magna cum laude,* or *summa cum laude.*

University Distribution Requirements

1. Before graduation all students in majors other than architecture or health and physical education must complete three or more semester hours from at least five of the six subject categories listed below and at least 12 semester hours from each of the subject categories designated by a Roman numeral.

I. 1. Literature and language

2. Art and art history, music, philosophy (except logic), religion, and humanities
II. 3. Economics, history, and political science
4. Anthropology, linguistics, psychology, and sociology
III. 5. Biological science, physical science, and engineering
6. Mathematics, mathematical sciences, logic, and computer science

Note that not all courses offered in the above fields are acceptable for distribution.

2. Students offering a major only in architecture or in health and physical education must complete three or more semester hours from at least five of the above six subject categories. They must complete at least 12 semester hours from each of two of the three pairs of subject categories designated by a Roman numeral and six semester hours from the third. Students offering multiple majors must satisfy the maximum distribution requirements of their various majors, or normally those stated in paragraph 1a. above.

3. The list of courses approved for distribution will be updated annually. Courses appeared on the approved list at the time they were taken. Individual appeals concerning distribution credit will be heard by the Committee on Examinations and Standing.

4. The first semester of a beginning language course will not count toward the distribution requirements without completion of the second semester.

Skills

English Competency Requirement. Every Rice student must demonstrate competency in English comprehension and composition. This requirement is satisfied by passing the English competency examination administered by the Department of English to all entering students during orientation week. Students who fail to pass this test are required to enroll in English 103, a one-semester course in composition which carries both degree and distribution credit. Satisfactory completion of this course then fulfills the English competency requirement.

Physical Education. Each student must pass two semester courses in basic health and physical education, although these courses do not count toward the semester hours required for a degree. Handicapped students may satisfy this requirement by taking individual instruction or classes arranged specifically to meet their needs.

Departmental Majors and Honors Programs

Students normally designate a major before preliminary registration for the junior year. To assist students with this selection, Majors Day is held early in the spring semester. Departments and preprofessional offices provide information about their programs at a central location. Once a student declares a major, the department or title of the major is then noted on the student's transcript and a faculty adviser is assigned. Introductory courses taken before formal designation of a major may be counted in fulfilling the major requirements.

In order to receive a bachelor's degree, a student must complete the requirements for at least one major. Students declare their major using a form provided by the Registrar. The department chair or designee must sign the form acknowledging the declaration. It is expected that the department will counsel the student about the requirements that must be met and the likelihood the student will be able to meet them. If the department believes a student is not well prepared for success in its major, it may express its reservations on the form. No department or program may, however, refuse to admit an undergraduate as a major, with the exception of the School of Architecture and the Shepherd School of Music or in the case of limitations of resources. In such cases departments must publish criteria

they will use to limit the number of majors together with their major requirements. Students normally declare a major at the end of the sophomore year, and will not be permitted to register for the second semester of the junior year without having declared a major. Students are always free to change majors in the junior or senior year, although this may entail one or more additional semesters at the University. Students and their advisers should regularly review progress toward their degrees.

For information on the specific requirements for any departmental major, students should consult the departmental listings under Courses of Instruction and seek the advice Undergraduate honors programs are open to qualified students, with departmental approval, in several departments. Through small classes and seminars, independent reading or research projects, and close contact with faculty research, students in an honors program may accelerate study in their major qualifications for admission and the content of honors programs may be found in the departmental listings under Courses of Instruction.

Second Four-year Bachelor's degree

Both currently enrolled and former Rice students already holding a bachelor's degree from Rice may earn a *second* different four-year bachelor's degree from Rice.

Students already enrolled at Rice may begin work on a second four-year bachelor's degree before completion of the first:

1. by being accepted for the second major by the major department and fulfilling all requirements for the second degree;
2. by completing a minimum of 30 additional semester hours at Rice beyond the hours required for their first degree, to be applied to the second degree.

Current Rice students seeking admission to this program should apply to the Registrar. The application should include a written statement of both proposed majors, and a course program for each. This statement should also contain a notation of approval from the chairman or undergraduate advisor from each department concerned, indicating that all major degree requirements will be satisfied with the proposed course program.

Student's holding a bachelor's degree from Rice may earn a different four-year bachelor's degree from Rice:

1. by being accepted for the major by the major department and fulfilling all requirements for the second degree;
2. by completing a minimum of 30 additional semester hours at Rice beyond their first bachelor's degree to be applied to the second degree;
3. by attending in full-time residence at Rice for at least two semesters during the fall or spring terms beyond their first bachelor's degree.

Former Rice students seeking admission to this program should apply to the Registrar. The application should include a written statement of the proposed major and course program for the second degree, a supporting letter from the chairman of the major department, and an explanation of the student's reasons for seeking a second degree.

Students with a bachelor's degree from schools other than Rice may earn a four-year bachelor's degree in a different major from Rice.

1. by being accepted for the major by the major department and fulfilling all requirements for the second degree;
2. by completing a minimum of 60 semester hours at Rice to be applied to their Rice degree;
3. by attending in full-time residence at Rice for at least four semesters during the fall or spring term.

Students with a bachelor's degree from schools other than Rice should apply for admission to the admission office and will be considered according to the procedures and

criteria for transfer students. Their application for admission must include all the materials listed above for applicants who are former Rice students plus an official transcript of the first degree.

Courses completed at Rice as a Class III student may be applied to a second undergraduate degree only on approval by the major department for that degree.

Information concerning financial aid available to participants in the second degree program may be secured from the financial aid office. Students admitted to the second degree program may request to be assigned to a College but will have lower priority for on-campus housing than students enrolled for a first four-year bachelor's program. The expectation is that such space will probably not be available.

Areas of Study

Architecture

Students interested in architecture may choose from programs leading to either the Bachelor of Arts or the Bachelor of Architecture degree. The Bachelor of Arts requires four years of study with a major in either architecture or architectural studies. Students who have completed or will complete the four-year B.A. with a major in architecture may apply for admission to the Bachelor of Architecture program.

During the fifth year, the student is normally assigned to a working preceptorship with an architect or architectural firm and then returns to Rice to complete a sixth year of architectural study for the degree. (Note that the major in architectural studies does not lead to the B.Arch. The School of Architecture encourages students to weigh their educational objectives and to choose among alternative courses of study offered. Further information on these programs may be found under Architecture in the Courses of Instruction section.

Engineering

The George R. Brown School of Engineering at Rice offers, through its seven departments, opportunities for a variety of curriculum and degree choices. Students interested in the engineering profession may major in chemical engineering, civil engineering, computer science, electrical engineering, mathematical sciences, mechanical engineering, or materials science and engineering for both undergraduate and graduate degrees. They may also take a double major combining environmental science with another science or engineering field. These programs lead to either the B.A. or B.S. degree and may qualify students for further study leading to a fifth-year professional master's degree, a Master of Science degree, or a Doctor of Philosophy degree.

During the first two years, engineering students should consult with the chairmen of the departments of interest or with the special first and second-year advisers appointed by each department for information and advice about details of the programs and choice of electives and about engineering as a profession.

Students may take a program of study during their first year which satisfies the first year requirements for all engineering departments. A listing of these courses and other information regarding the first two years of study is found under Engineering and Applied Science in the Courses of Instruction section of this catalog. Degree requirements and advanced courses are listed under the separate departmental listings in the same section.

Humanities

In the School of Humanities, majors are offered in art and art history, classics, English, French, German, health and physical education, history, linguistics, philosophy, religious studies, Russian, and Spanish.

An interdepartmental major in policy studies, which combines courses from the School of Humanities and the School of Social Sciences, is described below.

The requirements of each major may be found in the departmental listings under Courses of Instruction and are also available from the department chair and from the Registrar's Office.

Two special programs, the Program in the Humanities and the Joint Venture Program, are also described in the Courses of Instruction under the heading Humanities.

Social Sciences

The School of Social Sciences offers majors in anthropology, behavioral science, economics, political science, psychology, and sociology.

Interdepartmental majors in legal studies and policy studies, which overlap both the School of Social Sciences and the School of Humanities, are outlined below. The managerial studies major, which overlaps the School of Social Sciences, the Jones School, and the School of Natural Sciences, is described below.

The requirements of each major may be found in the departmental listings under Courses of Instruction and are also available from the department chair and from the Registrar's Office.

School Department	Degrees Offered	Additional Options, Areas of Concentration (within majors)
SCHOOL OF HUMANITIES		
Art and Art History	B.A., B.F.A., M.A.	Art history, studio art, archaeology, film and photography
Education	Master of Arts in Teaching	Teacher preparatory programs in 21 subject areas
English	B.A., M.A., Ph.D.	
French and Italian	B.A., M.A., Ph.D. None	
German and Slavic Studies	B.A., M.A., Ph.D. B.A.	
Human Performance and Health Sciences	B.A.	Physical education; sport science, sport medicine, sport management, teaching, coaching; health education as teaching field only
History	B.A., M.A., Ph.D.	
Linguistics	B.A., Ph.D.	Anthropological, English, Germanic, and Romance linguistics; semiotics, cognitive and computational linguistics
Philosophy	B.A., M.A., Ph.D.	
Religious Studies	B.A., M.A., Ph.D.	
Spanish Portuguese and Classics	B.A., M.A., None B.A.	Language and literature, language, Latin American studies
WIESS SCHOOL OF NATURAL SCIENCES		
Biochemistry	B.A., M.A., Ph.D.	Biochemistry, biophysical chemistry, molecular biology
Biology	B.A., M.A., Ph.D.	Biology, physiology, comparative biochemistry, developmental genetics, ecology, cell biology, molecular biology, animal behavior
Chemistry	B.A., M.A., Ph.D.	Chemistry, organic chemistry, physical chemistry, inorganic chemistry, chemical physics
Geology and Geophysics	B.A. in Geology; B.A. in Geophysics; M.A., Ph.D.	Stratigraphy, sedimentation, sedimentary petrology, marine geology-oceanography, carbonate petrology, igneous petrology, geochemistry, meteoritics and planetology, structural geology, regional tectonics, rock mechanics, reflection seismology, geodynamics, and engineering geophysics.
Mathematics	B.A., M.A., Ph.D.	Complex analysis, partial differential equations, mathematical physics, differential geometry, lie groups, topological dynamics, ergodic theory, geometric topology, algebraic topology, global analysis
Physics	B.A., M.A., Ph.D.	B.A. options: Physics, applied physics, biophysics, chemical physics, geophysics, and space physics and astronomy. M.A. and Ph.D. areas: Atomic and molecular physics, biophysics, condensed matter and surface physics, nuclear and particle physics, and astrophysics.
Space Physics and Astronomy	M.S., Ph.D. (For B.A. see physics department, space physics option)	Experimental and theoretical space physics, observational astronomy, astrophysics, atomic physics
SCHOOL OF SOCIAL SCIENCES		
Anthropology	B.A., Ph.D.	Anthropology; biological, linguistic, social/cultural anthropology
Economics	B.A., M.A., Ph.D.	Economics, Mathematical Economic Analysis
Political Science	B.A., M.A., Ph.D.	
Psychology	B.A., M.A., Ph.D.	
Sociology	B.A.	
Statistics	B.A., M.Stat., M.A., Ph.D.	

School Department	Degrees Offered	Additional Options, Areas of Concentration (within majors)
GEORGE R. BROWN SCHOOL OF ENGINEERING		
Chemical Engineering	B.A., B.S., M.Ch.E., M.S., Ph.D.	Biochemical, petroleum reservoir or biomedical engineering; polymer science; materials, process control, thermodynamics, transport phenomena
Civil Engineering	B.A., B.S., M.C.E., M.S., Ph.D.	Structural analysis and design, structural mechanics, environmental engineering
Computer Science	B.A., M.S., M.C.S., Ph.D.	Foundations of computer science, hardware systems, numerical computation, software systems
Electrical and Computer Engineering	B.A., B.S., M.E.E., M.S., Ph.D.	Bioengineering, circuits, control and communications systems, computer engineering, lasers, and solid-state electronics
Environmental Science and Engineering	M.E.E., M.E.S., M.S., Ph.D. (For B.A. as double major see department)	Biological, physical, and chemical treatment processes; hydrology and water quality modeling; water resources management; aquatic biology; inorganic and organic chemistry; atmospheric physics
Mathematical Sciences	B.A., M.A., Master in Applied Mathematical Sciences, Ph.D.	Computing, numerical analysis, operations research, physical mathematics, applied probability
Mechanical Engineering And Materials Science	B.A., B.S., M.M.E., M.M.S., M.S., Ph.D.	Computer applications, thermal sciences and energy conversion, gas dynamics, hydrodynamics and ocean engineering, stress analysis and mechanical behavior of materials, aerospace engineering, engineering science
SCHOOL OF ARCHITECTURE		
	B.A., B.Arch., M.Arch., M.Arch in Urban Design, D.Arch.	Architectural studies
SHEPHERD SCHOOL OF MUSIC		
	B.A., B.Mus., B.Mus./ M.Mus. simultaneously, M.Mu., D.M.A.	Composition, conducting, music history, performance, theory
JESSE H. JONES SCHOOL OF ADMINISTRATION		
	Master of Business Administration, Master of Accounting, Ph.D., in Accounting. (For B.A. see interdepartmental major in managerial studies. Both M.B.A. and MAcco. degrees are available on a "5-year" plan for undergraduates.)	Accounting, business entrepreneurship, finance, management information systems, international management, marketing, operations research, and public and nonprofit management
INTERDEPARTMENTAL MAJORS		
Area Majors	B.A.	Courses from two or more departments combined by the student and faculty advisor to form a coherent program
Behavioral Science	B.A.	Anthropology, psychology, sociology
Chemical Physics	B.A.	Chemistry, Physics
Managerial Studies	B.A. Both M.B.A. and M.Acco. degrees are available on a "five-year" plan for undergraduates (see Accounting and Administrative Science).	Accounting, computer science, economics, mathematical sciences, political science, psychology
Policy Studies	B.A.	Anthropology, economics, history, mathematical sciences, philosophy, political science, psychology, sociology

Managerial Studies

While Rice does not offer an undergraduate degree in either accounting or business administration, there is a special "five-year" plan by which Rice undergraduate can apply to enter accelerated degree programs for the Master of Business Administration (which includes concentration programs in accounting and in public and nonprofit management) or Master of accounting (see Accounting and Administrative Science). For details, contact the Jesse H. Jones Graduate School of Administration.

The managerial studies major is a preprofessional program for students planning management careers in either business or government. The program is interdepartmental and leads to the degree of Bachelor of Arts, either as a terminal degree or as preparation for graduate professional studies in accounting, law, business, or public management. Courses are drawn from the Departments of Economics, Computer Science, Mathematical Sciences, Political Science, and Psychology and include accounting courses offered as a service by the Jesse H. Jones Graduate School of Administration.

The program is designed to provide students with a comprehensive understanding both of the environment in which business firms operate and of the tools studies, students must complete 45 semester hours of approved coursework in the following subject areas: (1) accounting, (2) economics, (3) finance, (4) statistics, (5) quantitative methods, (6) computing, (7) business law, and (8) psychology. A list of approved courses is available from the program director, Professor Stephen A. Zeff, 352 Herring Hall, or from the managerial studies program advisers in each of the participating departments.

An honors program is available in managerial studies. This program is designed (1) to expand their knowledge of the managerial disciplines by means of specified advanced course work and/or independent research and writing and (2) to provide recognition for students who have demonstrated unusual competency in managerial studies. Students admitted to the honors program may elect certain graduate courses in accounting and administration as part of their major requirements. In addition, the undergraduate major may be partly satisfied by course work taken for the Master of Business Administration and Master of Accounting degrees.

The managerial studies program is administered by a committee consisting of faculty from the Departments of Computer Science, Economics, Mathematical Sciences, Political Science, Psychology, and the Jones Graduate School of Administration as well as student representatives. The program director chairs this committee. Student records for all managerial studies majors are maintained in the office of the program director. The managerial studies program director assigns students an adviser closely related to the area in which they intend to specialize. Students should consult with their adviser as early as possible to ensure establishment of an appropriate plan of study.

Music

The Shepherd School of Music offers four degrees: the Bachelor of Arts degree in music; the Bachelor of Music degree in performance, composition, music history, and music theory; the Master of Music degree in performance, composition, choral and instrumental conducting, musicology and music theory; and the Doctor of Musical Arts degree in composition and selected areas of performance. Normally, four years are required for the bachelor's degrees and two years for the master's. Qualified students may elect an honors program that leads to the simultaneous awarding of the Bachelor of Music and Master of Music degrees after five years of study.

The final two years of the B.Mus./M.Mus. program are devoted to specialization and can be entered only upon passing qualifying examinations administered in the fifth or sixth semester.

More detailed information about the Shepherd School and the requirements for degrees is given under Music in the Courses of Instruction section of this catalog. For information on the Shepherd School Diploma Program, write the Shepherd School of Music.

Natural Sciences

The Wiess School of Natural Sciences comprises the Departments of Biochemistry, Biology, Chemistry, Geology and Geophysics, Mathematics, Physics, and Space Physics and Astronomy. All but the Space Physics and Astronomy Department offer programs leading to the B.A. degree. Students may also elect double majors combining one of the programs in natural sciences with another science, the humanities, or an engineering field. The requirements for each major may be found in the departmental listings under Courses of Instruction, and are also available from the department chair and from the Registrar's Office.

Policy Studies

Policy studies is a liberal arts oriented interdisciplinary major focusing on policy issues that are of public interest. Evaluation and analysis of the determinants and effects of policy decisions are the central subject matter. It is a course of study concerned with theoretical issues as well as applied and prescriptive policy questions.

The policy studies major represents an area of concentration which can be taken only as a second major, complementary to a major in any University department. The intent of the major is to provide students from a wide variety of academic backgrounds with an understanding of the policy-making process and an intellectual foundation in the skills of policy makers and evaluators. Students in the fields of engineering and basic sciences considering professions in business and/or government would benefit from an understanding of how technical innovations or regulations are adopted and implemented as matters of public policy. Students in humanistic fields such as languages or English would receive systematic exposure to areas of study which have high intellectual appeal and in which their language skills might prove to be particularly valuable. Students should consult the Policy Studies section under Courses of Instruction for the list of requirements.

The administration of the program is in the hands of a committee consisting of representatives from the Departments of Anthropology (Professor Marcus) Economics (Professor Rimlinger), Philosophy (Professor Brody), Political Science (Professor Stein), Psychology (Professor Dipboye), Sociology (Professor Davidson), Mathematical Sciences (Professor Scott), and History (Professor Wiener). The chair of the committee is Professor Rimlinger. Students interested in policy studies should see Professor Rimlinger, who will assign them an adviser closely related to their field of interest.

Other Options for Undergraduate Majors

In deciding on a major, students are encouraged to select a course of study directed toward their personal goals. Several options are available besides the normal major in most departments. Further information on these may be found in the departmental listings.

1. **Areas of concentration** within departmental majors. Certain majors, including architecture, electrical engineering, German, physics, and Spanish, but not limited to these, have a choice of different areas of concentration with different course requirements within the department major.

2. **Double or triple majors** that fulfill the major requirements of two or three departments. The majors may, but need not, be in related fields: for example, computer science/math science or biology/English.
3. **Interdepartmental majors.** Interdepartmental majors are offered in chemistry with materials science or physics. Geophysics, behavioral science, managerial studies, and policy studies are examples of majors combining courses taught by faculty from several departments.
4. **Area majors.** Instead of selecting an established departmental major or program, students have the option of developing an area major which is closer to their particular interests and career goals. Whereas double majors must conform to the requirements of both departments, an area major is a single major that combines courses from two or more departments and forms a clearly coherent program with its own major requirements. An area major is normally initiated by the student and is worked out in conjunction with the Office of Student Advising and faculty advisers from each of the departments involved. Together they must agree on a title, which will then designate the area major on the student's transcript, followed by the names of cooperating departments: for example, problems of the contemporary city (architecture, sociology, environmental science, and engineering). The requirements for each area major are approved by the faculty advisers and certified by the Office of Student Advising, who are jointly responsible for the validity and acceptability of the program as a degree plan. In addition, students who elect to take an area major must also complete all other University graduation requirements.

Though students normally choose their majors at the end of the sophomore year, it is often possible to change majors or change from a departmental major to a related area major in the junior year. Students who might want to develop an area major but are uncertain which departments to approach and students who wish to change from a departmental major to an area major should consult with the Office of Student Advising. All applications for area majors must be certified by the Office of Student Advising before they are accepted by the Registrar. A student who chooses an area major may not double major in any other major.

Premedical, Prelaw, and Prebusiness Programs

In addition to the preprofessional and professional programs offered by Rice in accounting, architecture, business administration, engineering, public and nonprofit management, and music, a student may pursue a program which will satisfy the requirements for admission to graduate professional schools in business, dentistry, diplomacy and foreign affairs, health science, law, or medicine.

The predental adviser counsels students interested in premedical or predental studies and other areas of the health sciences. Those interested in prelegal studies should consult the prelaw adviser. These advisers may be contacted through their offices in the Ley Student Center. Information about a career in business, finance, or accounting can be obtained from the prebusiness adviser.

Students who plan to enter medical school or other professional or graduate school at the end of their junior year at Rice can arrange to receive a Rice four-year bachelor's degree by submitting to the Committee on Examinations and Standing a degree plan which fulfills all normal University and departmental requirements for the bachelor's degree. The degree plan must be submitted before students begin their graduate or professional training. Transfer credit for courses not to exceed the equivalent of ten courses of three or four semester hours are accepted if the individual courses are acceptable to the student's major department and the registrar according to normal procedures. Students

who have entered Rice after their first year must complete the minimum residence and course requirements for transfer students before leaving. The Committee on Examinations and Standing reviews the degree plan submitted by each student and gives final approval of the student's admission to the program.

While Rice does not offer an undergraduate degree in either accounting or business administration, there is a "five-year" plan by which Rice undergraduates can apply to enter accelerated degree programs for the Master of Business Administration (which includes concentration programs in accounting and in public and nonprofit management) or Master of Accounting (see Accounting and Administrative Science). For details, contact the Jesse H. Jones Graduate School of Administration.

Premedical and Predental Programs. The entrance requirements for medical and dental colleges of the United States are limited to relatively few courses: one year each of general chemistry, organic chemistry, physics, mathematics, biology, and English and laboratories required by the foregoing science courses. Because medical and dental schools show little or no preference for any one major, students planning a medical or dental career have the opportunity to choose their major on the basis of their interests and capabilities. They should keep two objectives in mind: (1) to secure a broadly based cultural background and (2) to master the necessary skills for an alternative career. Those who elect to concentrate in the sciences or engineering will automatically satisfy most of the entrance requirements. Students concentrating in the humanities need to make some adjustments in their study plan in order to fulfill the entrance requirements. Premedical and predental students are advised to discuss their plans with the premedical adviser.

Prelaw Studies. The academic requirement for admission to law school is satisfied by all degree programs offered at Rice. While many students major in history, political science, or economics, as a base for prelaw studies, no law school specifies particular courses or curricula as prerequisite to admission. Most require only a baccalaureate degree and the Law School Admission Test.

The Prelaw Handbook, published by the Association of American Law Schools and the Law School Admission Council, states that prelegal education should develop oral and written comprehension and expression as well as creative thinking and critical understanding of human values and that no one discipline is uniquely concerned with those objectives. Therefore, prelaw students should strive for development of their own capabilities within the areas of their greatest interest. Although there is no required course of study for the student interested in a legal career, the prelaw adviser recommends expository writing courses and beginning accounting and economics courses as useful to any law student.

Interested students should contact the prelaw adviser early, preferably in their first year at leading law schools are available in the prelaw office in the Ley Student Center. Prelaw students are encouraged to discuss their plans with the prelaw adviser.

Prebusiness Studies. Graduate business schools consider a variety of attributes when admitting students to their Master of Business Administration (MBA) programs:

1. Scholastic aptitude, as evidenced by undergraduate grades and the score on the Graduate Management Admission Test (GMAT),
2. extracurricular activities,
3. work experience,and
4. ability to communicate effectively in orally and in writing.

No one undergraduate major is favored over another. Students intending to study accounting or business administration at the graduate level are advised to select an undergraduate major (or majors) in which their academic performance is likely to be the strongest.

Regardless of one's undergraduate major, it would be wise to take Economics 211 and 212 and Accounting 305 as background courses. Since most major business schools prefer students who have relevant full-time experience, these courses will assist graduating seniors in obtaining employment in the private or public sector.

Students who are considering application to a graduate business school are encouraged to consult the prebusiness adviser early in their undergraduate years. Graduate business schools differ in their objectives, curricula, teaching methods, job placement possibilities, and admission standards, and prospective applicants should endeavor to become versed in the programs of different schools before beginning the application process. The prebusiness adviser can also suggest the kinds of work experience which graduate business schools find to be the most useful for prospective students.

Undergraduate students with exceptional academic records may apply for the "five-year" plan offered by the Jesse H. Jones Graduate School of Administration. Qualified students normally receive their bachelor's degree at the end of their senior year year. They then receive either the Master of Business Administration or Master of Accounting degree at the end of their fifth year at Rice.

Reserve Officers' Training Corps Programs

Rice University offers two Reserve Officers' Training Corps programs — the Army and the Navy. These programs seek to train college students so that upon graduation they may qualify as commissioned officers in a component of the United States Army, Navy, or Marine Corps. The Navy has two categories of midshipmen, one working toward a reserve commission and the other toward a regular commission. The Army normally awards reserve commissions; however, certain selected distinguished military students may be offered commissions in the regular Army.

Any student suspended by the University for academic failure or other cause is immediately discharged from the ROTC programs. Any student performing unsatisfactory work in military science or naval science courses or lacking satisfactory officerlike qualities may be discharged from the ROTC programs regardless of the quality of academic work. Enrollment in the ROTC programs at Rice University is normally made at the beginning of the fall term. Courses in naval science and military science are open to all students. These courses may be counted as free electives toward satisfying degree requirements, but they may not be used to satisfy any distribution requirements or departmental major requirements. The amount of credit assigned to each course is determined by the Provost, in consultation with the Committee on Undergraduate Curriculum. All such courses shall, however, count toward the determination of probation, suspension, course load, and grade point average.

Additional information regarding the ROTC programs and available scholarships is given under Military science and Naval Science in the Courses of Instruction section of this catalog.

Teacher Certification

Programs of study are offered to fulfill the Texas state requirements for teaching certificates on the secondary level in art, biology, chemistry, earth science, economics, English, French, German, health education, history, Latin, mathematics or mathematical sciences, physical education, physics, political science, psychology, Russian, general science, social studies, sociology, and Spanish.

Foreign Study Programs and Programs with Other Universities

Institute of European Studies

Rice is an university of the Institute of European Studies, a system of ten centers located in Durham, Freiburg, London, Madrid, Milan, Nantes, Paris, Vienna, Mexico

City, Singapore, and Nagoya, Japan. Each center offers a variety of opportunities to complement Rice major programs or to develop new interests. In each case, the institute center is associated with a host university, and students a combination of courses offered by both. Counselors and faculty from IES and the host university advise students in the selection of appropriate courses, facilitate registration at the university, arrange for university examinations, and provide transcripts to Rice. Students considering foreign study should arrange for prior approval of transfer credit through the academic department(s) involved and the Registrar.

Beaver College Center for Education Abroad

Rice is also affiliated with Beaver College Center for Education Abroad, which provides direct access to over 15 United Kingdom universities, among them various branches of the University of London, University of Bristol, and the University of Edinburgh. Beaver College also maintains a center in Vienna. These universities offer courses of study for Rice students with majors in science, engineering, the humanities, and the social sciences. Prior approval for transfer credit should be arranged through the academic department(s) and the Registrar.

C. D. Broad Exchange Program with Trinity College, Cambridge

This exchange program sponsored by the Student Aid Foundation Enterprises involves both students and faculty from Rice and Trinity College, Cambridge. Student participation, available through receipt of a competitive award, confers one year of study as a visiting student at Rice or at Trinity College in alternate years. Similar but shorter exchanges of Rice and Trinity faculty members will also be arranged through the program. The provost will appoint the Rice faculty member for the exchange program.

Further information on the program may be obtained from the Office of Student Advising and Activities or from the Office of the Vice-President for Student Affairs.

Rice-Swarthmore Exchange Program

An exchange program exists between Rice and Swarthmore College for qualified students in the fall semester of their sophomore, junior or senior year. Swarthmore, which is situated on a wooded campus near Philadelphia, is a nondenominational coeducational college with academic standards similar to those at Rice. The exchange is for the fall semester only. Rice students apply in January by submitting their own letter of application and two supporting letters from faculty members. The exchange is on a one-for-one basis with each student continuing to pay all charges and fees to his or her home school.

Prior approval of transfer credit should be requested for each course from the Registrar. Courses to be taken at Swarthmore which will apply to the student's major must also be approved by the department. Students who enroll in the normal program of four four-semester-hour courses at Swarthmore receive upon satisfactory completion 16 hours (or five courses) toward their Rice degree with a notation of specific courses which may count for fulfillment of major requirements or distribution within that block credit. Further information on this program may be obtained from the Office of the Vice-President for Student Affairs.

Dual Degree Program with Texas Southern University

A dual-degree program with Texas Southern University, a predominantly minority institution in Houston, enables students to attend TSU for two years, majoring in mathematics, physics, or chemistry. During the third year, if their work has been satisfactory,

the students transfer to Rice to major in engineering. After five years, a student normally receives a B.S. in some branch of engineering from Rice and a B.S. in mathematics, physics, or chemistry from Texas Southern. This program may lead to an additional year at Rice for the professional master's degree. It also prepares students for graduate work at Rice or any other institution offering graduate work in engineering.

Academic Regulations

All undergraduate students are subject to the academic regulations of the University. The Committee on Examinations and Standing administers the rules described below. Under unusual circumstances any student may submit a written petition to the committee requesting special consideration. All correspondence with the committee should be addressed in care of the Vice-President for Student Affairs.

Registration

Currently enrolled students complete registration in April for the fall semester and in November for the spring semester. Entering students complete their registration during Orientation for New Students the week before classes begin in August. New students must complete, sign, and return a matriculation card in order to be properly registered.

Unless a special tuition plan has been elected, all tuition and fees for the fall semester must be paid by the middle of August and for the spring semester by the end of December.

A student who does not register or request a delay from the Registrar by the deadline established by the Academic Calendar is considered withdrawn from the University by default. To be readmitted, the student must be eligible to continue and must pay a $25 late registration fee. No student is allowed to register after the fourth week of classes except with approval from the Committee on Examinations and Standing for good reason shown.

Students may change their registration by adding or dropping courses according to the proper procedure during the first two weeks of the semester without penalty fee. From the end of the second week to the end of the fourth week the student must obtain the instructor's permission to add a course. The deadline for adding courses is the end of the fourth week of classes; the deadline for dropping courses is the end of the tenth week, except in the case of courses in which loss of credit has been assessed by the Honor Council. Students who add or drop courses after the second week but before the above deadlines will be charged $10 for each drop/add form submitted. If the change is necessary because of a revision or cancellation of the course by the department, no penalty fee will be charged.

Course Programs

Students at Rice normally enroll in 15 to 17 semester hours each semester and thus in eight semesters complete the requirements for graduation in their major. Students who wish to register for more than 20 semester hours, or to enroll or continue in fewer than 12 hours, or to register simultaneously for credit at another university, must secure permission from the Vice-President for Student Affairs before filing their registrations. No student may receive credit for more than 20 semester hours in a semester, including courses taken elsewhere, unless he or she has received this prior written approval.

A student on academic probation is not allowed to enroll in more than 17 semester hours. A student who receives two or more "incomplete" grades in a semester is not eligible to enroll in more than 14 semester hours in the semester immediately following.

Students are prohibited from registering for more than one course at the same hour, unless they receive permission from the instructors involved.

Transfer Credit Including Credit for Summer School Courses Not Taken at Rice

The basis for approval of transfer credit toward a Rice undergraduate degree for courses taken at another college or university is equivalence in content and semester-hour credit to a Rice course. Transfer credit is granted for a total of no more than 14 semester hours taken during the summer at an accredited college or university other than Rice.

Students who wish to take courses at another university during an approved leave of absence or during the summer are advised to secure prior approval of transfer credit from the registrar by submitting the name of the school and the list of specific courses for which credit is requested. If courses taken elsewhere are to count as part of the student's major requirements, written approval for transfer credit must also be secured from the appropriate department.

Prior approval is recommended but not required. Courses may be submitted for transfer credit after the work has been completed. If approval of credit is granted, it is entered on the student's permanent record only when the Registrar receives an official transcript verifying completion of the work with a grade equivalent to "C-" or better.

Students transferring to Rice from another college or university should apply to the Registrar for transfer credit on the same basis.

Final Examinations

Final examinations are given in most courses, but the decision to give a final examination as a required part of the course rests with the instructor and the department.

No student may be required to take an examination comprehensive over the entire semester before the official examination period as scheduled on the academic calendar, nor may an instructor require that a take-home final examination be returned before the end of the scheduled examination period. These restrictions do not apply to laboratory examinations.

The Committee on Examinations and Standing also recommends that hour exams not be given in the final week of classes in those courses in which a final is given.

All tests and examinations are conducted under the honor system.

The Pass-Fail Option

An undergraduate student may register for courses on a pass/fail basis subject to the following limitations:

1. The total number of pass/fail courses taken as an undergraduate shall not exceed one for each full year of residence up to a limit of four. Students participating in off-campus programs administered through Rice will be considered in residence at Rice for the purpose of this rule.
2. The total number of pass/fail semester hours shall not exceed 14.
3. A student may register for only one pass/fail course in a semester.
4. No courses specifically required for the major, nor courses within the major department (or major area for area or interdepartmental majors) may be taken pass/fail.

Courses can be taken under the pass-fail option if the student files the proper form in the Registrar's Office no later than the end of the fourth week of classes. The student may

convert any course so designated to a graded course prior to the end of the tenth week by filing the proper form with the Registrar. Students should consider declaring pass/fail declarations early in the semester and changing to a grade designation later if appropriate. The Committee on Examinations and standing rarely approves conversion to a pass/fail designation after the deadline. Students should be aware that while a P does not affect the GPA, an F for a course taken pass-fail does count in the GPA.

Grade Symbols and Designations

Courses are graded using the following symbols:

A	very high standing
B	high standing
C	satisfactory standing
D	low standing
F	failure
P	pass—students successfully taking a course pass/fail receive a P.
S	Students successfully completing a designated satisfactory/fail course receive an S. The grade of S indicates satisfactory completion of a course in which traditional grading procedures are not used. Unsatisfactory completion of such a course is indicated by the grade of F. Course or labs in which traditional grading procedures are not used must be designated in the "Schedule of Courses Offered" published each semester by the Registrar. Courses so designated may be counted toward the completion of a major. Students should be aware that while an S does not affect the GPA, an F received in such a course does.

Designations for special purposes:

W	withdrew
INC	incomplete
##	other
NG	no grade reported by instructor
NC	no credit granted for this course

These designations, explained below, do not affect grade averages.

Instructors are required to report a grade for all students (except auditors) whose names appear on the class list. For students who also receive a designation of "incomplete" or "other," this grade is determined on the basis of zero credit for the work not completed and does not become part of the student's record except as discussed below. For the students who withdraw from the University within the last five weeks of classes, this grade, which will not appear on the student's record, but will be used solely in determining eligibility for readmission, should be based on the performance of the student up to the time of withdrawal.

A designation of "incomplete" is reported to the Registrar by the instructor when a student has not been able to complete a course because of verified illness or other circumstances beyond the student's control during the semester. Such work must be completed and a revised grade submitted by the end of the fifth week of the next semester; otherwise, the Registrar's Office will record the grade originally submitted by the instructor.

A designation of "other" is reported to the Registrar if a student fails to appear for the final examination after completing all the other work of a course. A designation of "other" must be resolved and a revised grade submitted by the end of the first week of classes of the second semester or by the end of the fourth week after commencement,

whichever is applicable. If no revised grade is received, the Registrar's Office will record the grade originally submitted by the instructor.

A designation of "withdrew" appears for each course for which the student was enrolled at the time of withdrawal from the University. Courses dropped by students prior to the late drop deadline are removed entirely from the transcript. A "W" is recorded for any course dropped with the approval of the Committee on Examinations and Standing after the late drop deadline. See also the section voluntary withdrawal and readmission for rules concerning withdrawal in the last five weeks of classes.

A designation of "no grade" indicates that the instructor failed to report a grade. Instructors are asked to resolve this situation as quickly as possible.

Students with designations of "incomplete" and "other" should be aware that they may go on probation or suspension when these are changed to grades.

Grade Points and Grade Averages

Grade	Grade Points
A	4.0
B	3.0
C	2.0
D	1.0
F	0.0

Plus and minus signs may be attached to each grade except F. One-third of a grade point is added or subtracted, respectively. It is general University grading practice to give pluses and minuses.

Grade point averages (GPA's) are calculated as follows. For each course, the product of the course credit attempted and the grade points for the grade earned is calculated. These products are added for each course and the result is divided by the total credit attempted. The result is the GPA.

GPA's are reported each semester on the student's grade report, and may appear on unofficial transcripts. However, GPA's are not included on official transcripts; nor are they reported to any external agency. Class ranks are likewise not reported externally.

Faculty Grading Guidelines

The following guidelines on grading have been drawn up by the committee on Examinations and Standing for the information of faculty and students. the committee believes that the following policies have long been supported in practice by the faculty both individually and collectively:

1. The evaluation of the student's performance in a course and a decision on the appropriate grade is the responsibility of the designated instructor or instructors in the course.
2. No student should be given an extension of time or opportunities to improve a grade that are not available to all members of the class, except for verified illness or justified absence from campus. Students who have three scheduled final examinations in two consecutive calendar days may, however, take one of the examinations at another time.
3. Students in independent study courses are not to be allowed an extension beyond the time when grades are due. Faculty are to submit grades at the end of the semester for such students based on work completed during the semester. The instructor directing the independent study bears responsibility with the student

both for ensuring that the work undertaken is appropriate to the span of a semester and for determining the degree credit to be received.

4. The basis for grading and the expectations on all written assignments or tests should be clearly explained to the class in advance, preferably in writing at the beginning of the semester. The instructor should explain clearly which assignments or homework are covered by the Honor Code and which are not. To prevent allegations of plagiarism on written assignments, students should be warned that all direct and indirect quotations from others sources should be properly acknowledged. The instructor should explain the extent to which the student's paper is expected to be independent of the references and clearly distinguishable from them.
5. Instructors should be willing to give any student an explanation of his or her grade as consistent with the grading for the rest of the class. For this reason the Committee urges the faculty to preserve all examinations and written material not returned to students as well as grade records for the semester for at least one month into the following semester so that students may, if they wish, review with their instructor the basis for the grade which they have received.
6. Instructors may not change a semester grade after the grade sheet has been submitted to the Registrar except for a clerical error in calculating the grade. This is a long-standing University rule of which the faculty are reminded by the Registrar at the end of each semester. It is designed in part to protect the faculty from student pressure for grade changes. All other grade changes, including retroactive change to *withdrawal* or *incomplete,*must be approved by the Committee on Examination and Standing on the basis of a written petition from the student and information from the instructor.
7. There is no University requirement that a final examination be given in a course. However, the University Council has expressed its concern about:
   a. tests given during regular class time toward the end of scheduled classes, generally in liu of a final examination, since there is no way of controlling the number of such tests which a student may have within a period of one or two days, and
   b. unlimited-time, take-home final examinations which cannot be completed in the three hours normally allowed for final examinations but encourage students to spend a day or more in completing the test in the hope of improving their grades.
   c. both the above practices defeat the intention of allowing students to divide their time between their various classes to their best advanatges. This is the purpose of the reading period and self-scheduled final examinations.
8. Freshmen students receive mid-semester grades around the eighth week of the fall and spring semesters so that they can, if advisable, enroll in tutoring or drop a class for which they may not be prepared. Faculty who teach freshmen in any of their classes will be asked to submit grades of standing for these students during the *seventh week* of the semester and should schedule the grading of tests, quizzes, or homework assignments accordingly. These grades are not recorded on the student's transcript nor calculated in the GPA, but they are important indicators for students and their faculty advisors.
9. Departments using teaching associates, adjunct professors, or visiting faculty of any kind should make sure these teachers are familiar with rice grading procedures. A regular faculty member who is well versed in the grading guidelines should be assigned to assist such instructors.

The Chair of the Committee on Examinations and Standing or the Vice President for Student Affairs will be glad to advise any faculty member faced with exceptional circumstances which may justify special consideration. Students may petition the Committee

concerning the application of these guidelines. Suspected or possible violations of the Honor Code should be submitted to the Honor Council.

President's Honor Roll

Outstanding students are recognized each semester through the publication of the President's Honor Roll. In order to be eligible, students must have grades exclusive of pass-fail and satisfactory-fail in a total of 12 or more semester hours and must not have any grade of "F." Approximately 30 percent of all undergraduates are so recognized. Undergraduates enrolled in four-year bachelor's degree programs are always eligible for the Honor Roll. Students enrolled in five-year bachelor's/master's programs are eligible only during their first eight semesters.

Academic Probation

A student is placed on academic probation if at the end of any semester:

1. the student's grade point average for that semester is less than 1.67 or,
2. the student has a cumulative grade point average less than 1.67. This requirement is waived if the GPA for that semester is at least 2.0.

The period of probation extends to the end of the next semester in which the student is enrolled at the University. A student on probation (academic or disciplinary) is not permitted to be a candidate or hold any elective or appointive office. This restriction is also embodied in the constitution of the Student Association.

Academic Suspension

A student is suspended from the University if at the end of any semester:

1. the student earns grades that would place him/her on academic probation a third time, or;
2. the student earns a grade point average less than 1.00 for the semester, except for students completing their first semester at Rice.

Students readmitted after a previous suspension will again be suspended if in any succeeding semester they fail to achieve at least one of the following requirements:

1. a cumulative and semester grade point average of at least 1.67, or;
2. a semester average of at least 2.00.

The period of a first suspension is normally one semester; the period of a second suspension is at least two semesters. Normally, students will not be readmitted following a third suspension.

Suspension is deemed to occur as soon as a responsible University official, normally the Registrar, learns that a student's performance has been such as to place him or her on suspension. Suspension is lifted the first day of class of the semester in which the student returns to the University, or in the case of persons who have served the nominal term of suspension but do not intend to return to Rice when they have received permission from the Committee on Examinations and Standing to have that suspension lifted.

A student who earns grades in a semester that would place him or her on academic suspension but who otherwise satisfies the requirements for graduation in that semester will be allowed to graduate.

Disciplinary Probation and Suspension

A student may be placed on probation or suspension for an honor code violation or for disciplinary reasons through action of the proctor. No student may receive a degree while on disciplinary suspension (including that for an honor code violation), even if all academic requirements for graduation have been fulfilled.

Readmission After Suspension

To obtain readmission after academic or disciplinary suspension, the student must address a letter of petition to the Committee on Examinations and Standing, which should be received at least a month before the beginning of classes, and at the same time, request two supporting letters from persons under whom the student has worked during the suspension period as a student or an employee. If the problems causing the previous difficulty appear to have been relieved, the student is generally readmitted. In some instances, approval of readmission may be postponed, or suspension may be permanent. Petitions for readmission following a separation from the University involving disciplinary or other non-academic consideration will be subject to review by the proctor before consideration by the Committee on Examinations and Standing. A student desiring special consideration with regard to readmission following suspension should petition the committee in writing.

The Committee on Examinations and Standing does not normally place students on probation and suspension as the result of deficient performance in the Rice Summer School (although it may do so at its discretion). Students are warned, however, that grade averages are affected.

Voluntary Withdrawal and Readmission

A student may withdraw voluntarily from the University at any time during the semester up until the last day of classes and, if in good academic standing at the time of withdrawal, the student is normally readmitted upon written application to the Committee on Examinations and Standing.

Any student desiring to withdraw should inform the college master in person and give written notification of withdrawal to the Vice-President for Student Affairs, who will notify other offices of the University as necessary. If the student withdraws within five weeks of the last day of classes, grades of standing as of the day of withdrawal are considered in determining eligibility for readmission. Students with grades of standing that would have placed them on suspension had they not withdrawn will, for purposes of readmission, be treated as if they had been suspended. Such students should follow the guidelines for readmission shown under the suspension rules. Students who fail to give notice of withdrawal should expect to receive failing grades.

Leave of Absence

A student may request a leave of absence from the University by applying in writing to the Committee on Examinations and Standing at any time prior to the first day of classes in the semester which marks the beginning of the leave. Leave from the University after the first day of classes is considered a voluntary withdrawal.

To be readmitted following an approved leave of absence of not more than four semesters, students need only notify the Vice-President for Student Affairs of their intention to return at least one month before the beginning of the semester. After four semesters, they should apply in writing to the Committee on Examinations and Standing, as in the case of a voluntary withdrawal.

Approval of a leave of absence is always contingent on the student's satisfactory completion of course work in the semester preceding the leave; otherwise, the approved leave may be converted to suspension.

Extended Time Graduation

Students enrolled in four (five-) year bachelor's programs may elect to be subject to the academic regulations in effect either at the time of their intial registration at Rice or at the time of their graduation, unless they graduate more than seven (eight) years after that initial registration. In that case they will be subject to the regulations in effect at the time of their last readmission.

Courses in a student's major program completed more than seven (eight) years prior to graduation are subject to review by the appropriate departments. If the departments conclude that any such courses are no longer suitable for satisfying the requirements of the major, those courses will not be credited toward the major program, although they will remain on the student's record.

Rice Tutorial Program

Departments with major teaching assignments in introductory courses provide tutoring to students having academic difficulty. Each participating department names a department coordinator who is responsible for organizing tutoring activities and assigning students who need tutoring to groups or individual tutors. Assignments are made on a mutually agreeable basis after consultation.

Each residential college selects a faculty associate who has agreed to serve as college coordinator. This faculty member seeks ways to aid communication and help advise students who may need tutoring. The entire tutoring program is under the supervision of the Director of Student Advising. Tutoring is available for freshmen enrolled in any course or for upperclassmen registered in an introductory course. The normal procedure is for the student to consult with the course instructor or the department coordinator; however, the college coordinator and the program coordinator are available for consultation and assistance.

Information concerning the tutorial program may be secured from the Office of Student Advising and Activities.

Admission of New Students

From its beginning, Rice University has sought to maintain an academic program of the highest excellence for a small body of students. This number has grown with the expansion of the University's resources over the past decade, but the total number of students admitted to Rice still remains relatively small—approximately 550 students in each first-year class.

In making its selections, the Admission Committee attempts to seek out and identify students who have demonstrated exceptional ability and the potential for personal and intellectual growth. There is no discrimination whatever on the basis of sex, race, ethnic background, age, or physical handicap. Decisions are based not only on high school grades and test scores but also on such qualities as leadership, participation in extracurricular activities, and personal creativity. The University's aim is diversity rather than uniformity, and it believes that students learn from each other and from life in the residential colleges, as well as from their classes and laboratories.

Students are selected on a competitive basis in five academic areas. They are: (1) architecture, (2) humanities and social sciences, (3) engineering, (4) music, and (5) natural sciences. Applicants should give careful consideration to the category under which they wish to be considered. Students, however, are free to change from one of these areas to another, after consultation with their adviser. Only architecture and music have strictly limited enrollments. Occasionally, physical limitations of other departments may make it necessary to limit enrollment of majors.

There are five basic measures generally used in evaluation of candidates for admission: (1) scholastic record as reflected by the courses chosen and the quality of performance, (2) scores on the Scholastic Aptitude and Achievement Tests administered by the College Board, (3) recommendations from teachers and counselors, (4) the personal interview, and (5) the application itself. The Admission Committee is particularly interested in any information that can give insight into the extracurricular areas of development and such intangible factors as motivation, intellectual curiosity, character, and special talents.

1. **The High School Record.** The completion of not less than 16 acceptable units is required. The record must include the following units:

English	4	Laboratory science	2
Social Studies	2	(biology, chemistry, physics, etc.)	
Mathematics	3	Additional credits in above-	3
A foreign language	2	listed subjects	
		Total	16

Students admitted with academic deficiencies will be asked to complete the required work by taking high school or college level courses during the summer before enrollment at Rice.

Courses in chemistry, physics, trigonometry, or other advanced mathematics courses are required of applicants for the engineering and science divisions.

2. **Entrance Examinations.** The required entrance examinations are administered by the College Board. The College Board bulletins and test applications are available from high school counseling offices or the Rice Admission Office. The applicant is responsible for making arrangements to take the examinations, and official score reports must be submitted before the student can be considered for admission (see the calendar on page 79).

The following tests are required according to the curriculum desired:

A. Humanities, Social Sciences, Architecture, and Music

(1) Scholastic Aptitude Test
(2) Three Achievement Tests as follows
  (a) English composition*
  (b) any two of the following:
    A foreign language
    American history
    European history and world cultures
    Literature
    Mathematics
    A science

B. Science and Engineering

(1) Scholastic Aptitude Test
(2) Three Achievement Tests as follows
  (a) English composition*
  (b) Mathematics (Level I or Level II)
  (c) Chemistry or physics

*with or without essay

3. **Candidates must submit evaluations from a counselor and one teacher.** The necessary forms are included in the application.

4. **The Personal Interview.** The interview is an integral part of the admission procedure. It enables the Committee on Admission to reach a decision based on nonacademic, as well as academic, aspects of the candidate's development. Students should arrange for an interview in compliance with the admissions calendar on page 79. Campus interviews are held at 109 Lovett Hall between the hours of 9:00 a.m. to 4:00 p.m. Monday through Friday, and until 11:30 on Saturday mornings. (Summer schedule: Monday through Friday, 9:00 a.m. to 4:00 p.m.) Houston area students who fail to interview will not be considered for admission. Applicants who cannot visit the University or who are unable to meet with a traveling member of the admissions staff may be interviewed by alumni interviewers located throughout the United States and in several foreign countries. If an applicant cannot be interviewed by one of these methods, the interview may be waived. Candidates for admission to the Shepherd School of Music must arrange for an audition and theory test with the music faculty. Architecture applicants should interview with a faculty member in the School of Architecture and submit a portfolio.

5. **The Application.** The application provides the committee with important information on the student's background and gives the applicant an opportunity to provide statements on his or her interests, experiences, and goals. Please note that no application fee is required of candidates for admission to Rice.

Early Decision Plan

The Early Decision Plan is open to candidates for admission who regard Rice University as their first choice and will await the outcome of their application to Rice before applying elsewhere. Students applying for the fall semester 1988 under the Early Decision Plan must complete the required College Board examinations on or before the June testing date in the junior year. All other materials should be filed by October 15. Admission notices will be mailed on December 1.

Requirements for admission are not altered by an early decision. Those accepted are expected to complete the remainder of their high school work with superior performance. Early Decision candidates should apply for financial aid using the Early Version of the Financial Aid Form (FAF). Those applying by November 1 will be notified by December 1. Late filers will be notified as soon as their information is processed.

Action on some applications will be deferred until the Regular Decision period if the Admissions Committee does not have adequate grounds for an affirmative decision in December. An additional semester of the high school record and additional College Board

scores from the November, December, or January tests may be added for later consideration. The applicant would, of course, be released from the pledge to apply only to Rice. An applicant offered admission under the Early Decision Plan must make a $100 registration deposit within 30 days in order to hold his or her place in the incoming class. This deposit is nonrefundable after May 1. Those who wish to reserve a room on campus must make an additional $50 deposit.

Interim Decision Plan

Applicants who complete their SAT and Achievement Tests on or by the December testing date and who file all other materials by December 1 may be considered in the Interim Decision Plan and notified of the outcome by early February. Action on some applications may be deferred until the Regular Decision period if the Admission Committee does not have adequate grounds for an affirmative decision in February.

Applicants offered admission under this plan must make a $100 nonrefundable registration deposit within 30 days of the notification date. Those who wish to reserve a room on campus must make an additional $50 deposit.

Regular Decision Plan

Regular Decision applications completed by January 15 are considered by April 1. Applications received after January 15 are considered only after all earlier applications. Candidates who apply after January 15 must do so in full knowledge that they are in a highly speculative position.

Regular Decision applicants who are offered admission should make a $100 registration deposit by May 1 to reserve their places in the incoming class. This deposit is not refundable. Those who wish to reserve a room on campus must make an additional $50 deposit.

Financial aid applicants for Interim and Regular Decision should consult the calendar on page 79 for deadlines and notification dates. Late filers will be notified as soon as their information is processed.

Admissions Calendar

EARLY DECISION	INTERIM DECISION	REGULAR DECISION	TRANSFER
Application by October 15	Application by December 1	Application by January 15	Application by April 1 for fall, Nov. 1 for spring
Required SAT and Achievement Tests on or by June test date in the junior year	Required SAT and Achievement Tests completed on or by Dec. test date	Required SAT and Achievement Tests completed on or by Jan. test date	Required SAT if never previously taken
Notification of admission mailed December 1	Notification of admission mailed February 1	Notification of admission mailed April 1	Notification in late May or December
Financial Aid Form (Early Version) filed by November 1 Financial Aid notification by December 1	Financial Aid Form filed by Jan. 15 Financial Aid notification by February 1	Financial Aid Form filed by March 1 Financial Aid notification by April 1	Notification when admitted; allow 1 month after filing Financial Aid Form
Deposit within 30 days nonrefundable after May 1	Deposit within 30 days nonrefundable	Deposit by May 1 (candidates' Reply Date) nonrefundable	Nonrefundable $100 deposit with 15 days of admission

NOTE: For students desiring on campus accommodations, a $50.00 room deposit should accompany your registration deposit. The room deposit may be refunded or credited to the applicant's account until May 1. No application fee is required of candidates for admission to Rice.

Advanced Placement

Entering first-year students who have done work well beyond the usual high school courses in certain subjects and who score "4" or "5" on the Advanced Placement College Board examinations prior to matriculation at Rice are given University credit toward graduation for appropriate Rice courses satisfying distribution or free elective requirements. Acceptance of such credit in fulfillment of a student's major requirements is subject to approval by the department in question.

Rice also gives credit for a strong performance on the College Level Examination Program (CLEP) test in chemistry and biology.

During orientation week at the beginning of the academic year, entering students may take advanced placement tests administered by various departments at Rice. On the basis of these tests, students may be advised to register in courses beyond the introductory level. Degree credit is not given for these tests.

Transfer Students

Rice University encourages application from students with superior records who wish to transfer from a two-year college or a four-year college or university. Interested students should request a transfer application form from the Office of Admission.

Applications for admission in the fall semester should be filed before April 1 and be accompanied by official transcripts of all high school and college work completed to date and courses in progress. Notification of admission is mailed in late May. Applications for admission for the spring semester with the appropriate transcripts must be filed by November 1. Notification of admission is mailed by mid-December. The criteria used in evaluating transfer applications are essentially the same as those applied to applicants for the first-year class, except that special emphasis is given to performance at the college level. Because of the highly competitive nature of transfer admission, it is recommended that applicants have a minimum 3.2 (4.0 scale) G.P.A. on all college work. Scholastic Aptitude Test scores are required. If candidates have not previously taken College Board tests, they must take the Scholastic Aptitude Test no later than April if they wish to apply for admission in the fall. Achievement Tests are not required.

Transfer students must be registered in residence at Rice for at least four full semesters during the fall or spring terms and must complete not less than 60 semester hours for a Rice degree.

For further information or application forms, prospective candidates for admission as undergraduates should communicate with the Office of Admission. When requesting application forms, candidates should clearly indicate that they are prospective transfers from another college.

Visiting Students

Students who wish to spend a semester or a year at Rice taking courses for credit to be applied toward their undergraduate degree at another school should apply for admission as visiting students through the Office of Admission. The student's application should be accompanied by an official transcript of college work to date and a letter from the student's academic dean or registrar agreeing to grant transfer credit subject to satisfactory performance.

Visiting students are assigned membership in a college during their stay and are charged the same fees as other undergraduates. In a few classes where enrollment is limited because of space or other considerations, candidates for Rice degrees have priority over visiting students.

Class III Students

Class III standing at Rice University designates students with an undergraduate or graduate degree from an accredited college or university who are taking courses for credit but not in a specific degree program. For additional information, see page 110 of the graduate section.

Admission of High School Students to Take Courses for Credit

Accelerated high school juniors and seniors who have taken all the courses in a given discipline available to them in high school or who have completed their high school graduation requirements may request admission to Rice for the purpose of taking one or more University level courses on the same basis as Rice undergraduates. Such courses are graded for credit, and the University sends a transcript of this record on request by the student

to any college or university. If the high school student is later admitted to Rice, any such courses are counted toward the student's undergraduate degree at Rice. Tuition for such courses is $210 per semester hour plus a $50 registration fee, the total not to exceed $2,450. These charges are for 1987-88 and are subject to change in subsequent years. Application for admission should be made to the Admission Office. Financial assistance is not available for this program.

Auditors

Any interested person, including currently enrolled students, may audit one or more courses at Rice by securing permission of the instructor and by registering as an auditor with the Registrar. The University grants no academic credit for such work. Audit credit does not appear on transcripts. Currently enrolled students may audit courses without charge. Rice alumni may audit as many courses as they wish for a fee of $25 per semester. All others are charged $50 per course per semester for the privilege of auditing.

Student Housing

Prospective students should indicate on the application for admission whether or not they desire to reside on the campus. Information about residence in the colleges and room application forms accompany the notice of admission sent to each new undergraduate. Room reservations cannot be made prior to notification of admission.

At present, Rice University has the capacity to house about 70 percent of its undergraduate students in the residential colleges on campus. Although the majority of students desiring to live in the colleges can be accommodated, demand usually exceeds the available number of rooms. Every effort is made to provide housing in the colleges for all incoming first-year students who wish to live on campus, but continuing students cannot be promised space and must draw for rooms according to the priority system in each college. No student is required to live on campus. Off-campus members are encouraged to eat in their colleges and to participate in college activities.

Correspondence from new students regarding housing in the residential college should be addressed to the Office of Admission. Information concerning off-campus housing is available from the Office of Student Advising and Student Activities.

Tuition, Fees, and Expenses

The tuition for undergraduate students in 1987-88 is $4,900 per year, $2,450 payable prior to the beginning of each semester.

Part-time students taking fewer than 12 hours by special permission are billed at the part-time rate of $210 per semester hour for the courses in which they are enrolled plus a $50 registration fee, the total tuition and registration fee not to exceed $2,450 per semester.

Any undergraduate who withdraws or takes an approved leave of absence and is then readmitted to the university is charged the tuition in effect during the semester in which he or she returns.

Fees

All undergraduate students and candidates for a second bachelor's degree are charged the following annual fees, payable in full at the time of the student's first tuition payment for the year or any portion of the year. An exception is the Health Service fee, which is paid in two installments, half before the beginning of the fall semester and half before the beginning of the spring semester.

Subsidies to student activities	$42.60
Tickets to athletic events	35.00
College fee	40.00
Health Service fee	123.20
Total basic fees	$240.80

All Rice students are required to have health insurance. Insurance for the 1987-88 school year may be purchased at a yearly premium of $323.00 (Plan A) or $226.00 (Plan B) from the University's program developed for Rice students. Coverage will be effective from 12:01 a.m., August 15, 1987, until 12:01 a.m., August 15, 1988. Dependent coverage is also available (application and policy description can be obtained from the Cashier's Office or the Office of Student Activities and Advising). If you have other medical insurance, a waiver card showing proof of insurance must be signed and returned to the Cashier's Office by August 15 to avoid being charged for insurance.

Special Charges

Orientation week room and board (required for all new students)	$70.00
ROTC	$25.00
Late payment/late registration fees	$25.00
Late course change	$10.00
Late application fee for Class III	$50.00

Refund of Tuition and Fees and Appeal Procedure

A student who withdraws during the first two weeks of the semester is not charged tuition or fees for that semester. A student who withdraws during the third week is charged 30 percent of the semester's tuition. The amount of the refund is reduced by 10 percent at the beginning of each successive week. No refund is made for withdrawals after the ninth week. There is no refund of fees or special charges after the second week of classes in the semester. The $100 registration deposit paid by incoming students is not refunded at any time if the student withdraws. There is no partial refund of fees paid for the full year for withdrawals or leaves of absence in the spring semester.

Student requests for special consideration in connection with waivers, refunds, or adjusted payments on tuition, fees, and other charges, which cannot be satisfactorily resolved between the student and the Cashier's Office, should be forwarded to the Vice-President for Student Affairs. Resolution of waivers and refunds for room and board charges should be arranged through the Vice-President for Administration.

Teacher Certification Program Fees

Students enrolling in the apprenticeship or the internship plan are charged a $100 registration fee for each semester; an additional $25 registration fee (paid to the Office of Continuing Studies) is charged for each summer session.

Delinquent Accounts

No student in arrears in any financial obligation to Rice University as of the date announced for the completion of registration for any semester can be registered. No certificate of attendance, diploma, or transcript of credit is issued at any time for a student whose account is in arrears.

Students who have not made satisfactory arrangements with the Cashier for payment of current charges or have moved on campus without executing a satisfactory room contract may be discharged from the University.

Transcripts

Transcripts are issued on written request made to the Office of the Registrar. No transcript is issued without consent of the individual whose record is concerned. There is a charge of $1 for each copy, payable in advance. Those requesting transcripts by mail should include payment with the request.

Living Expenses

Residence fees, to cover costs of dining halls and operation of residences, are established from year to year as requirements dictate. For 1987-88, the yearly room and board charge for residence in a residential college is $4,025. This charge provides room and three meals per day excluding the evening meals on Saturdays and Sundays. Meals are not served during the Thanksgiving holidays, midyear, fall, and spring midterm recesses, and the spring holidays. Information on optional meal plans is available from the College Food Services. When securing room assignments for the academic year to follow, each student is required to make a room deposit of $50. To assure reservation of space, current students must make room deposits by the date established in the various colleges, but no later than April 15. New students are required to make a similar deposit prior to May 1. These deposits are not returnable but are applied against the following semester's charges. The balance of the residence fee is payable in installments. The exact amounts and due dates are stated in the residential college agreement that each on-campus resident is required to sign.

Students dismissed through the action of duly constituted authority within the University from the college or the University for academic or disciplinary reasons shall be entitled to a prorata refund or credit of room and board payment or charges. Students terminating their residence in the college for any other reason shall be entitled to a pro rata refund or credit of the yearly payments or charges less a withdrawal fee of $50 for those who announce in writing their intention not to occupy their space in the college before July 1 for fall semester and before December 1 for spring semester. A withdrawal fee of $200 will be assessed for those withdrawing after July 1 or December 1. The student hereby agrees that the foregoing withdrawal shall be liquidated damages for breach of this agreement, and the applicable fee as determined from the above will be deducted from the refund. Prorata refunds or credits for room and board shall be determined on the basis of regular operating school days, i.e., first day of class through last day of finals. (In the event that the prorata amount is less than $200, the withdrawal fee shall equal the prorata amount.) Termination of residence shall be the date that the student informs the master in writing that the student is no longer a resident in the college or the date that the space was effectively made available for occupancy by another student, as certified by the college master and the Vice-President for Administration or his designate, whichever date is later. Any personal belongings of the student remaining within the room after such space is certified to be available shall be disposed of by the University.

Modifications of the policies concerning refunds shall be made only in exceptional cases. Requests for such exceptions must be made in writing to a committee composed of the master of the college concerned, the Vice-President for Student Affairs and the Vice-President for Administration by application to the college master.

All items included, the young man or woman entering Rice University in August 1987 and living on campus needs to have available about $10,850 the first year. For a student living at home, the cost is about $8,150.

Financial Aid

The financial aid program at Rice University provides assistance to meet the costs of attendance for all students who are admitted and demonstrate computed financial need. Through grants, low interest loans, campus work opportunities, or a combination of these programs, Rice attempts to give the students sufficient aid to meet educational expenses.

The financial aid program is funded from many sources. Rice University receives contributions from alumni and friends, which are used to initiate and maintain scholarships and loan funds. Federal programs, both grant and loan, the state grant program, and the Rice University tuition grant also provide funds. Awards are based primarily on financial need.

The University will publish budgets that state total student expenses realistically, including, maintenance at home, on the Rice campus or in the community, personal expenses, and necessary travel.

Parents are expected to contribute according to their means, taking into account their income, assets, number of dependents, and other relevant factors. Students themselves are expected to contribute from their own assets and earnings, including appropriate borrowing against future earnings.

A brochure entitled *Financial Aid at Rice University* explains the program of assistance in detail. Students may secure a copy from the Office of Admission or the Office of Financial Aid. The determination of need is based on information supplied through the College Scholarship Service. Need is defined as the amount required to meet the difference between the student's total educational expenses and the family's resources.

Application

To apply for financial assistance, the candidate must file a Rice University financial aid application with the University as well as the Financial Aid Form (FAF) with the College Scholarship Service. When Rice University receives both forms, the applicant is considered for all appropriate assistance administered by the University including grants, scholarships, loans, and work. Tax forms will also be required.

Early decision candidates may obtain the Early Version Financial Aid Form from Rice University. In order to receive notification of awards at the same time as notification of admission, this form and the application for financial aid must be filed by November 15. Interim Decision candidates must file the Rice University financial aid application and the Financial Aid Form by February 1, and Regular Decision candidates must file both forms by March 1 in order to receive notification of awards at the same time as notification of admission. Forms filed after these dates will be considered as received. There is no deadline for new students.

Financial aid awards are made on an annual basis and are payable as indicated on the award letter.

Since financial circumstances change from year to year, annual review and adjustment of need and awards is necessary. Therefore, continuing students must file the Rice University financial aid application with the University and the Financial Aid Form with the College Scholarship Service by June 1 (December 1 for second semester only) every year in which they desire assistance.

Financing

Meeting the costs of higher education in a private university may be difficult even though the usual financial analysis indicates no need for financial aid. It is understood that even though a family's assets may be adequate to afford the cost of tuition, fees, and room and board without financial aid, payment of relatively large sums at stated times may require rearrangement of family planning that results in hardships or sacrifice. Rice University offers two payment plans to permit financing of educational costs. Both require low interest charges.

A deferred payment plan permits the payment of each semester's charges to be divided over four payments. Arrangements are made through the Cashier's Office. Applications and details are available each semester at the time of billing.

Longer term financing is available to eligible students through the Parent Loans for Undergraduate Students (PLUS) program. Applications are available in the Rice University Office of Financial Aid, and Rice will arrange processing if needed.

Satisfactory Progress Policy for Financial Aid Recipients

The Higher Education Act of 1965, as amended by Congress in 1980, mandates that institutions of higher education maintain minimum standards of "satisfactory progress" in order for students to receive financial aid. Rice University makes these standards applicable to all institutionally awarded funds and Pell Grants, Guaranteed Student Loans, and Parent Loans for Undergraduate Students for the purpose of maintaining a consistent policy for all students receiving assistance. To satisfy satisfactory progress requirements a student must maintain a minimum GPA each semester, complete a required number of hours each year, and complete his degree requirements within a determined number of semesters.

Policy for Undergraduate Students

1. Financial Aid Probation. A student is placed on financial aid probation if at the end of any semester: (a) the student has a cumulative grade point average less than 1.67, or (b) the student's grade point average for that semester is less than 1.67. The period of probation extends to the end of the next semester in which the student is enrolled at the University.

2. Financial Aid Ineligibility. A student is ineligible for financial aid if at the end of any semester: (a) the student earns grades that would result in financial aid probation a third time, or (b) the student earns a grade point average less than 1.00 for that semester, except for students completing their first semester at Rice.

3. Reinstatement of Financial Aid Eligibility. The period of financial aid eligibility is normally at least one semester. To regain eligibility, the student must address a letter of petition to the Committee on Student Financial Aid following the same instructions which apply to the readmission of suspended students as written in the Rice University *General Announcements*. Suspended students readmitted by the Committee on Examinations and Standing need not petition the Committee on Student Financial Aid if the conditions in Section 5 have been met.

4. Requirements for Students Regaining Financial Aid Eligibility. A student regaining financial aid eligibility will again become ineligible if in any succeeding semester he/she fails to achieve either: (a) a cumulative and semester grade point average of at least 1.67, or (b) a semester average of at least 2.00. Ineligibility a second time will result in at least two semesters without aid. Normally a student will not again receive aid after a third ineligibility.

5. Maximum Time Frame to Complete Educational Objective. Undergraduate students are eligible to receive financial aid for 10 semesters (except Rice Tuition Grant — see Section "C" of "Rice University — Financial Aid Policies and Procedures"). All semesters for which a student has a transcript in the Registrar's Office are counted in the 10 semester limitation even if no financial aid was received. To make normal satisfactory progress, a student must earn a minimum of 18 semester hours credit by the end of the first academic year, 44 semester hours credit by the end of the second year, 70 semester hours credit by the end of the third year, and 96 semester hours credit by the end of the fourth year. A student who is ineligible because of insufficient semester hours credit may be considered eligible for aid only when enough credits, including incomplete courses, have been completed to make up the credit shortage. The academic year commences with the first day of classes of the fall semester and continues to the first day of classes the following fall.

Policy for Graduate Students

Satisfactory academic progress will be determined by the student's department at the end of each academic year but the student must have at least a 2.33 cumulative GPA.

Notification for All Students

The Office of Financial Aid will notify, by letter, any student qualifying for financial assistance who does not meet minimum satisfactory progress and who is being terminated from aid. Following the fall semester, notices are considered delivered when sent to the colleges of undergraduate students and to the departments of graduate students. Following the spring semester, notices will be sent to the most recent permanent address provided to the Registrar by the student and are considered delivered.

Appeals for All Students

Any student deemed ineligible for financial aid due to lack of satisfactory progress has the opportunity to appeal such action to the Committee on Student Financial Aid. Appeals must be made in writing to the Chairman of the Committee. Mitigating circumstances will be considered.

Student Loan Funds

Perkins Loans (fomerly NDSL) are awarded by the Office of Financial Aid to help meet the self-help portion of aid under Rice University packaging policy.

A few endowments have been established for student loans primarily as memorial tributes. These funds are in addition to the normal financial aid program. They are used for emergency loans to students who experience unexpected financial problems during a term or for a student who shows additional need beyond regular eligibility.

Karl Bailey-William Carroll Memorial Loan Fund

Frank McFadden Caldwell Loan Fund
Louise Adele Drenkle Loan Fund
Mary Alice Elliott Loan Fund
Gulf Oil Educational Foundation Loan Fund
Houston Bridge League Loan Fund
Benjamin S. Lindsey and Veola Noble Lindsey Memorial Loan Fund
Lora B. Peck Loan Fund
Rice Institute Loan Fund
Students Memorial Loan Fund
Owen Wister Literary Society Alumnae Loan Fund

Student Employment

Employment is available to students interested in working part time during the academic year. These work opportunities are available both on campus and off campus. Students seeking employment should apply directly to the Financial Aid Office.

Vocational Rehabilitation

The Texas Rehabilitation Commission offers assistance for tuition and nonrefundable fees to students who have certain disabling conditions if their vocational objectives have been approved by a TRC counselor. Examples of such conditions are orthopedic deformities, emotional disorders, diabetes, epilepsy, and heart conditions. Other services are also available to assist the handicapped student in becoming employable. Application for such service should be made at the Texas Rehabilitation Commission. Students with visual handicaps should contact the Texas State Commission for the Blind.

Undergraduate Scholarships and Awards

Alumni and friends of Rice University have generously endowed many awards and scholarships, some of which are given strictly on the basis of entrance qualifications or performance at Rice. Students do not make separate application for these awards since every admitted or attending student is eligible for consideration.

For other awards, demonstrated need is an additional factor and evidence of need must be submitted to the Office of Financial Aid. Some awards may have additional criteria.

Further information concerning the donors is available from the Office of Financial Aid, the Office of the Vice-President for Student Affairs, or the Office of Admission.

General Awards and Scholarships

I. Administered Through the Office of Financial Aid

Achievement Rewards for College Scientists Foundation Scholarship
Joe L. and Barbara Allbritton Scholarship
Florrie Ethel and M. E. Andrews Scholarship
Robert and Elaine Andrews Scholarship
Association for Systems Management Scholarship
Max Autrey Memorial Scholarship

Axson Club, Ellen Axson Wilson Scholarship
Axson Club, Katie B. Howard Scholarship
Axson Club, Special Scholarship Honoring Mrs. A. S. Foote
Axson Club, Pauline M. Crouch Scholarship
Axson Club, Elanor Trotter Huddleston Scholarship
R. C. Baker Foundation Scholarship
James Foulds Barbour Scholarship
Eric and Arabella Beall Scholarship
H. Leroy Bell Scholarship
Mr. and Mrs. Val T. Billups Scholarship
Kyriakouli Bitzes Scholarship
Beverly and Donald Bonham Scholarship
Weldon Brigance Scholarship
Fletabel Denton Briggs Memorial Scholarships
Brown and Root Officers Scholarships Honoring George R. Brown
Clyde and Ethel Butcher Scholarship
George Alva Chatfield Scholarship
Class of 1921 Scholarship
Class of 1929 Scholarship
Class of 1930 Scholarship
Class of 1931 Scholarship
Class of 1932 Scholarship
Class of 1933 Scholarship
Class of 1934 Scholarship
Class of 1935 Scholarship
Class of 1936 Scholarship
Class of 1937 Scholarship
College Bowl Champions Scholarship
Arthur B. Cohn Scholarship
William Arthur Combs Scholarship
Millie Tutt Cook Scholarship
Kenneth Wallace Cunningham Scholarship
Daughters of the American Revolution, John McKnitt Alexander Scholarship
Daughters of the American Revolution, Fannie Bess Emery Montgomery Scholarship
Daughters of the American Revolution, Lady Washington Texas Centennial Award
Decade 1975 Scholarship
Decade 1976 Scholarship
Thomas A. and Pauline M. Dickson Scholarship
Thomas P. and Maude Seeger Dow Scholarships
Epoch Matching Funds
Thomas Flaxman Scholarship
Thomas R. and Julia H. Franklin Scholarships
Joe Gallegly Scholarship
General University Scholarship Fund
Glasscock Scholarship
Richard L. Grider Scholarship
Lionel B. Hohenthal Scholarships
Gary Hornberger Scholarship
Mercer T. Ingram Scholarship
Interfaith Charities Scholarship
Alfred R. and Eleanor H. Johnson Scholarship
Grant William Jordan and Cora Jordan Memorial Scholarships

Julia Merle and Roy Lay Scholarship
A.C. Lederer, Jr. Scholarship
Patrons of E. L. Lester and Company Scholarship
H.A. Lott, Inc. Scholarship
Daniel B. and Mary H. Lovejoy Scholarship
Genevieve Parkhill Lykes Scholarship
J. Everett McAshan Scholarship
Margaret Brokaw McCann Scholarship
John Charlton McCoy, Jr. Scholarship
Michael Vincent McEnany Award
Emma S. McGree Scholarships
McInnis Family Memorial Scholarship
James G. and Alberta Matteson McMurtry Scholarship
Franklin G. and Harriet Chelgren Meck Scholarship
Achille and Malline Meyer Memorial Scholarship
Frances Black and Raymond Moers Scholarship
Elizabeth Morford Scholarship
Berney L. Morgan Scholarship
W. Kyle Morrow, Jr. Scholarship
Frank Moser and Professor R.A. Tsanoff Scholarship
Motheral-Neilan Scholarship
National Action Council for Minority Engineers
Ida R. and Hanna E. Nussbaum Scholarship
Rebecca Raphael and Lily G. Nussbaum Scholarship
Charles Breckenridge Parkhill Scholarship
Raymond Pearson Scholarship
Elsie Rachlin Scholarship
Emanuel and Mose Raphael Scholarship
Robert H. Ray Memorial Scholarships
Ernest R. Rechel Memorial Scholarships
William J. Reckling Memorial Scholarship
Rice/TSU Dual Degree Program
Mrs. L. A. Richardson Scholarships
Edith Ripley Scholarship
Duane Rivers Scholarship in Chemical Engineering
James M. and Sarah Rockwell Scholarships
Pamela Davis Rogers Scholarship
Catherine Withers Roper and Benjamin E. Roper Memorial Scholarship
Willie Rowell and Ruth Andrews Scholarship
Anita and Campbell Sewall Scholarship
Shell Incentive Funds
Mr. and Mrs. Samuel T. Sikes Scholarship
Samuel T. Sikes, Jr. Scholarship
Evelyn Slomovitz Memorial Scholarship
Society of Rice University Women Scholarship
Southland Paper Mills Foundation Scholarship
Sara Stratford Scholarship
Nola McCarty Symms Scholarship
Hope Pierce Tartt Scholarship
Beth Turner Scholarship
USX Foundation Scholarship
Herschel M. Vaughan Student Scholarship
Abe and Rae Weingarten Scholarship
Harris Weingarten Scholarship

Elizabeth Aldridge Wells Scholarship
Gordon R. West Scholarship
Willoughby C. Williams Scholarship

II. Administered Through the Office of Admissions

Astronaut Fund
Eric and Arabella Beall Scholarship
Board of Governors Scholarships
Beverly and Donald Bonham Scholarship
Class of 1921 Scholarship
Class of 1929 Scholarship
Class of 1930 Scholarship
Class of 1931 Scholarship
Class of 1932 Scholarship
Class of 1933 Scholarship
Class of 1934 Scholarship
Class of 1935 Scholarship
Class of 1936 Scholarship
Class of 1937 Scholarship
Kenneth Wallace Cunningham Scholarship
College Bowl Champions Scholarship
Decade 1975 Scholarship
Decade 1976 Scholarship
George Foundation Scholarship
Richard L. Grider Scholarship
J.L.C. McFaddin Scholarship
W.P.H. McFaddin Scholarship
Meredith H. James Scholarship
Patrons of E.L. Lester and Co. Scholarship
James G. and Alberta Matteson McMurtry Scholarship
Franklin G. and Harriet Chelgren Meck Scholarship
Gilbert A. Metz, Jr. Scholarship
Elizabeth Morford Scholarship
Motheral-Neilan Scholarship
Robert H. Ray Memorial Scholarship
Rice Sponsored National Merit Scholarships and National Achievement Scholarships
William Marsh Rice Scholarships
Pamela Davis Rogers Scholarship
Volney J. Rose Scholarship
The Roy Scholarships
Lee Sharrar Scholarship
Evelyn Slomovitz Memorial Scholarship
Southland Paper Mills Foundation Scholarship
James U. and Margot Teague Scholarship
Beth Turner Scholarship
USX Foundation Scholarship
University Scholars Scholarship
Charles K. and Maidie Autry Wilbanks Student Fund
Dr. Carlton E. Wolters Scholarship

III. Administered Through the Office of the Vice-President for Student Affairs

Samuel S. Ashe Scholarship
Graham Baker Studentship

James A. and Alice Graham Baker Distinguished Scholar
James A. and Alice Graham Baker Honor Scholars
Board of Governors Scholarships
Chapman-Bryan Memorial Scholarship
College Women's Club Scholarship
Edith Jo Leeseman Dissinger Scholarship
James H. Durbin Scholarship
T.C. Edwards Scholarship
Mary Parker Gieseke Scholar
Richard P. Goodwin Scholarship
Annette Schreiber Hill and William Bruce Hill Scholarship
Gaylord Johnson Scholars
Mason G. Lockwood Engineering Scholarship
The Lottman Scholarships
Byron Meredith Scholarship
Torkild Rieber Award
Daniel Ripley Scholars
The Roy Scholarships
Richard Steed Scholarships
Louis Sudler Prize in the Arts
Blanche White Honor Scholars
Willoughby C. Williams Scholarship

IV. Miscellaneous

Paul Frederick Bobb Award
Barbara Long Chilton Scholarship
Tom Crumpton Memorial Award
Susan T. Scanlon Scholarship
Jameson Fellowship

Awards and Scholarships in Departmental Disciplines

Architecture

Alpha Rho Chi Award in Architecture
American Institute of Architects School Medals
AIA/AIAF Scholarship
Edward B. Arrants Award in Architecture
Rosemary Watkin Barrick Traveling Fellowship
James H. Chillman, Jr., Prizes
John Crowder Memorial Scholarship
William D. Darden Medal
M. N. Davidson Fellowships
Featherlite Scholarship in Architecture
Margaret Everson Fossi Traveling Fellowship
Gensler Scholarship
Gene Hackerman Scholarship
Jesse H. Jones Scholarship in Architecture
Roderick M. Jones Scholarship
Morris R. Pitman Award
Louis Sudler Prize in the Arts
Texas Architectural Foundation Awards
William Ward Watkin Traveling Fellowship

Art and Art History

Art Supply Award
Kyriakouli Bitzes Scholarship
Mavis C. Pitman Memorial Prize in Art
Christine Croneis Sayres Memorial Art Award
Louis Sudler Prize in the Arts
Texas Art Supply Company Award

Athletics (Honorary Awards)

George R. Brown Football Awards
Emmett Brunson Award
Walter W. Fondren, Jr., Memorial Scholarship
Gene Hackerman Award
Catherine Hannah Award
Joyce Pounds Hardy Award
Kay Pearson Keating Award
Eva Jean Lee Award
Joe F. Lipscomb Freshman Award
George Martin Award
T. S. Martino Scholarship
Harry W. McCormick Scholarship
Dell Morgan Award
Jess Neely Football Awards
Neely-Davis Scholarships
John Plumbley Memorial Award
Hally Beth Poindexter Award
Robert Pilcher Quin Award
"R" Association Award
Hugh C. Welsh Scholarship
Billy Wohn Award
also
Bing Crosby Loan Fund

Bio-Chemistry

T.J. Vanzant Scholarship

Chemistry

Z. W. Salsburg Memorial Awards

Drama/Theater/English

Barbara L. Chilton Scholarship
Susan T. Scanlon Scholarship

Economics

Blanche Randall Haden Scholarship
Wall Street Journal Student Achievement Award

Education

Millie Tutt Cook Scholarship
Donald I. Wood Award

Engineering

Herbert Allen Merit Award
American Institute of Chemical Engineers, South Texas Section, Scholarship
R. C. Baker Foundation Scholarships
George R. Brown Scholarship
Brown Scholarships in Engineering
Harriana Butler Scholarship
Gerard A. Dobelman Memorial Scholarship
Steven G. Dobelman Memorial Scholarship
Albert Fanestiel Scholarship
Gulf Foundation Scholarship
Lillian Haynie Scholarship
Houston Engineering and Scientific Society Scholarship
Paul N. Howell Annual Award in Chemical Engineering
Charles Francis Cyrus Johnson Scholarship
Jacobs Engineering Group, Inc., Scholarship
A. C. Lederer, Jr., Scholarship in Civil Engineering
Paul Alois Lederer Scholarship in Civil Engineering
Mason G. Lockwood Engineering Scholarship
H.A. Lott, Inc., Scholarship
Lottman Scholarship
McDermott Incorporated Scholarship
Gilbert A. Metz Scholarship in Mechanical Engineering
W. L. Moody, Jr., Scholarships in Engineering
Thomas W. Moore Scholarship in Chemical Engineering
NL Industries Scholarship
National Action Council for Minorities in Engineering
National Society of Professional Engineers Scholarship
Oshman Scholarships for Women in Engineering
Rice Engineering Alumni Outstanding Engineering Student Awards
Hershel M. Rich Invention Award
Duane M. Rivers Scholarship in Engineering
Shell Incentive Funds Scholarship
Mr. and Mrs. Samuel T. Sikes Scholarship in Mechanical Engineering
Samuel T. Sikes, Jr., Scholarship in Engineering
James Redding Sims Scholarship in Civil Engineering
Sohio Scholarship
Texaco Scholarship
USX Foundation Scholarship
Louis J. Walsh Scholarships/Fellowships in Engineering
James S. Waters Creativity Award

English

Genevieve Parkhill Lykes Scholarship

French

Clyde Ferguson Bull Traveling Fellowship

Pi Delta Phi André Bourgeois Award
William J. Reckling Memorial Scholarship

Geology

Torkild Rieber Award
Torkild Rieber Scholarship
W.A. Tarr Certificate

German and Slavic Studies

Max Freund Prize in German
Dr. and Mrs. Mitchel Fellowship for German and Russian Language Study Abroad

History

Kyriakouli Bitzes Scholarship
Mary Hayes Ewing Publication Prize in Southern History
Barbara Field Kennedy Prize in American History
Clifford Lefton Lawrence Award in British History
Captain Charles Septimus Longcope Award
Susie Smith Vandiver Scholarship
Willoughby C. Williams Scholarship

Human Performance and Health Sciences

G. L. Hermance Award in Physical Education
Jill Pitman Jones Award

Managerial Studies

H. Russell Pitman Award in Managerial Studies
Transco Energy Company Scholarships
Wall Street Journal Student Achievement Award

Mathematics

Willoughby C. Williams Scholarship

Military Science

American Legion for General Military Excellence Awards
American Legion/Andrew Jackson Memorial Award
Houston Chamber of Commerce Military Affairs Committee Award
Armed Forces Communications and Electronics Association Award
Reserve Officer Association Award Scholarship
Society of American Military Engineers Award
Society of American Military Engineers William S. Bailey Scholarship
Sons of the American Revolution Scholarship

Music

Denson Endowed Scholarship for Percussion
Elva Kalb Dumas Prize in Music
Lillian H. Duncan Prize in Piano
Frederick Royal Gibbons Memorial Award
William E. and Elva F. Gordon Scholarship

Erwin and Emily Heinen Prize in Music
Mary Root Kirkland Prize in Voice
Gwendolyn Jaster Lederer Scholarship in Piano
Larry J. Livingston Prize in Violin
Bertha Mallard Scholarship for Music Composition
Dr. Joseph A. and Ida Kirkland Mullen Scholarships
Sallie Shepherd Perkins Prize in Music
Burt Duke Raiza Prize in Piano
Shepherd Society Awards and Scholarships
Dorothy Richard Starling Scholarships in Violin

Naval Science

Armed Forces Communications and Electronics Association Awards
Distinguished Naval Graduate Award
Mary Henry Gibson Scholarship
Jesse H. Jones Naval Scholarships
Commander F.C. Johnson Award
Military Affairs Committee, Houston Chamber of Commerce Award
Navy League Award
Reserve Officers Association Award
C. Grady Smith Memorial Award
Society of American Military Engineers Award
Texas Society — Sons of the American Revolution Award
United Services Automobile Association Scholarship Award
United States Naval Academy Alumni Association Award

Philosophy

Jacob and Babette Atlas Prize in Moral Philosophy
Frank Moser and Professor R.A. Tsanoff Scholarship
Hilda Atlas Rich Scholarship
Tsanoff Undergraduate Essay Prizes

Physics

Claude W. Heaps Prize in Physics

Political Science

Charles Breckenridge Parkhill Scholarship in Political Science

Religious Studies

Edith Jo Leeseman Dissinger Scholarship

Rice Institute for Policy Analysis

Shell Scholar in Public Policy

Sociology

Weber-Durkheim Prize for Excellence in Sociology

Spanish

Barzan Scholarship for Summer Study Abroad
Sacks Scholarship for Summer Study Abroad
Tsanoff Scholarship for Summer Study Abroad
Robert Wells Scholarship for Summer Study Abroad

College Awards (Some Honorary)

Marie Alexander Leadership Award
Athenian Awards
Donald R. Baker Scholarships
H. E. Bray Freshman Award
Franz and Frances Brotzen Award
J. Dennis Huston Sports Award
Jones College Scholarships
Jones Master and President Award
Leeds Award for Excellence in Scholarship
John E. Parish Fellowship
Richardson College Master's Award for Excellence in Scholarship
Z. W. Salsburg Award
Jackie Schnell Memorial Scholarship
Graham C. Stebbings College Service Award
Corrinne and Radoslav Tsanoff Sophomore and Junior Prizes
Harry Carothers and Olga Keith Wiess Scholarship
Olga Keith Wiess Award

In addition to the above awards, Rice is invited to nominate students for several scholarships and fellowships which provide funds for foreign study and travel or later graduate work. Final selections for these awards are made nationally or regionally.

Edwin, Frederick, and Walter Beinecke Memorial Scholarship
Churchill Scholarships
Danforth Fellowships Fulbright-Hays Scholarships
Latin American Scholarship Program of American Universities, Inc. (LASPAU) Scholarships
Henry Luce Scholarships
Marshall Scholarships (British)
Rhodes Scholarship (British)
Silver Medal of the Royal Society for the Encouragement of Arts, Manufactures, and Commerce (British)
Harry S. Truman Scholarships
Thomas J. Watson Fellowships
Woodrow Wilson Doctoral Dissertation Fellowship in Women's Studies
Zonta International Amelia Earhart Aerospace Award

Honor Societies

The Phi Beta Kappa society was founded in 1776 at the College of William and Mary for the purpose of recognizing intellectual achievement and the love of learning among

students in the liberal arts and sciences. The Rice University chapter was formally installed on March 1, 1929.

Phi Lambda Upsilon, an honorary chemical society, promotes high scholarship and original investigation in all branches of pure and applied chemistry. The Rice chapter was installed in 1927.

The Pi Delta Phi society, organized to interest students of French in competing for high standing in scholarship, authorized in May 1930 the formation of the Theta chapter of Rice.

The Society of Sigma Xi, for the promotion of research in science, established the Beta of Texas chapter at Rice on March 23, 1938.

The Tau Beta Pi Association, organized to interest engineering students in competing for high standing in scholarship, created the Gamma of Texas chapter at the University on December 18, 1940.

Delta Phi Alpha was founded to promote an interest in the German language and literature. The National Council authorized the Gamma Xi Chapter at Rice in April 1949.

Sigma Delta Pi was founded to promote an interest in the Spanish language and literature. The Rice University chapter was installed on May 14, 1953.

Tau Sigma Delta is a national honor society in architecture and applied arts. The Tau Chapter was established at Rice on May 7, 1961.

Eta Kappa Nu was founded in 1904 at the University of Illinois for electrical engineering students. The purpose was not just to stimulate and reward scholarship, but to assist and encourage it members to grow professionally throughout their entire lives. The Rice chapter was installed January 1981.

Omicron Delta Epsilon was founded to promote study in economics. The Rice University chapter was established in 1981.

Student Life

Student Responsibility

Each Rice student is expected to observe standards of conduct consistent with respect for the law, the fulfillment of contractual obligations, consideration for the rights of others, and a high level of personal integrity. Though the University does not intend to supervise the personal lives of its students, all members of the University community are encouraged to be aware that their behavior both on campus and off campus may reflect on the University.

The student government, the judicial system, and the honor system depend on a willing exercise of responsibility and honor on the part of everyone.

The University reserves the right to require the withdrawal of any student whose conduct may be judged clearly detrimental to the best interests of either the student or the University. such action is taken only after careful consideration by the appropriate branches of the student government and/or the faculty and administration.

No individual or group may use the name of the University or one of its colleges without prior approval of the University and the college.

The Honor System

One of the oldest and proudest traditions at Rice is an honor system administered by a student Honor Council whose members are elected annually by the student body. Adopted by a vote of the student body in 1916, the system has remained essentially unchanged except for changes in the procedures and membership of the Honor Council.

All written examinations and any specifically designed assignments are conducted under the honor code. The student body, through its commitment to the honor system, accepts responsibility for assuring the validity of all examinations and assignments conducted under the system. The Honor Council is responsible for investigtation of all reported violations and for trial in those cases when the facts warrant. The proctor reviews the results of investigations and trials and acts upon recommendations for penalties. The Honor Council conducts a continuing program to orient new students and faculty to the responsibilities and privileges of the system.

Residential Colleges

Every undergraduate student, whether living on campus or not, is a member of one of eight residential colleges, all of which are coeducational.

Each college has a faculty master and co-master who occupy a house adjacent to the college. The master, whose authority derives from the president of the University, has overall responsibility for all aspects of student life in the college. He or she is especially responsible for encouraging broad cultural and intellectual interests and for promoting self-discipline and effective self-government within the college. Other members of the faculty are invited, upon agreement of the student members and the master, to becomed resident and non-resident associates of the college. Faculty associates act as advisers to the members and participate in the camaraderie and activities of the college. several colleges also have nonfaculty university associates and community associates from the Houston area, drawn from various professions.

Each college is a self-governing group of students whose elected officers and representatives are responsible ato the master and to the college membership for directing a variety of cultural, social, and athletic activities, for the appropriate and responsible expenditure of college funds, and for maintaining good order in the college. While uniformity among the colleges has never been sought, and each college has developed its own particular interests and character, all seek to foster fellowship among their members and a mature sense of honor, responsibility, and sound judgment.

Upon acceptance by the University, each undergraduate student is designated a member of one of the colleges. Two students who are entering Rice for the first time may ask to be assigned to the same college but may not designate which college. A new student may request membership in the same college as a close relative. No other choice of college is allowed.

The buildings of each college include a dining hall and living rooms, which are available to both resident and nonresident members, and living quarters for approximately 215 students from all classes of the University, and all academic disciplines. At present, on-campus residential space is available for most of the first-year students who request it, but space is not assured until receipt of formal notification. Continuing students draw for the available space by the priority and lottery system established in each college since the demand exceeds the available space.

The College Food Service provides 19 meals per week, excluding evening meals on Saturday and Sunday. Breakfast and lunch meals are cafeteria service, and dinner is seated, family style. No meals are provided on designated holidays and recesses. Various services provided by the College Food Service for students living in the colleges include: (1) assistance with special diets prescribed by a physician; (2) sack lunches for students who must miss a meal due to a job conflict; (3) sick trays for students when requested by the Student Health service; and (4) alternate menu entree, whenever possible, in accordance with students' religious practices.

College Courses

As one of their important activities, individual colleges sponsor courses and workshops open to all students. College courses are initiated by students in the colleges during the semester before they are offered. Following approval by the master and faculty associates of the college and by the Vice-President for Student Affairs, they are accepted for academic credit on the same basis as departmental courses and listed by the Registrar each semester during preliminary registration. If a college course falls within a definite departmental field, it can, with written approval of the departmental chair, count as part of the distribution requirements in the category to which that field is assigned.

College workshops carry no academic credit and do not appear on a student's permanent record. Generally designated for instruction in practical skills, they may meet on a regular schedule throughout the semester or be offered as short courses.

By expanding the course offerings of the departments, college courses promote the academic involvement of the colleges and provide opportunity for interdisciplinary topics of particular interest to students.

Student Government

All undergraduates are members of the Rice Student Association, which is governed through the Student Senate, composed of the president, two vice-presidents, the secretary, treasurer, the eight college presidents, and eight college senators.

Alleged violations of University or college rules are handled in accordance with the University Code of Judicial Procedure. In most cases, original jurisdiction is assigned to student courts, appeal from whose verdict may be made to the college master, the proctor, or the University Review Board is appropriate. Final appeal is to the president of the University. The Honor Council, which is composed entirely of students, administers the honor system and conducts hearings and trials for alleged offenses against it. The University retains ultimate authority in all matters of discipline and over all actions affecting its educational function or the safety and well-being of members of the University community.

The Student Association annually presents two coveted awards, one to a student and one to a faculty or staff member. The Rice Service Award, a memorial to Hugh Scott Cameron, first dean of students at Rice, is awarded to currently enrolled or former members of the Student Association who have rendered distinguished service to the student body. Selection lis made by a committee of faculty and students appointed by the association. The Menton Recognition Award recognizes extraordinary service to the student body by a current member of the faculty or staff.

Student Activities

In addition to the many activities of the residential colleges, various campuswide organizations and activities give students a wide range of choices for extracurricular interests. The official publications include the *Thresher,* the student newspaper, the *Campanile,* the university annual; and the *University Blue,* a literary publication. The Rice Program Council sponsors various programs of current interest to the student body as well as social functions. A campus radio station, KTRU, is operated by students on an 18-hour, seven-day-a-week schedule, broadcasting FM stereo.

A large number of student organizations provide for special interests, such as the Black Student Union, the Hispanic Association for Cultural and Educational Revitalization, the Chinese Student Association, Rice Democratic Caucus, and Young Republicans.

There are sports clubs for sailing, karate, rugby, lacrosse, soccer, etc. A student debate society, a premed society, and a prelaw society serve other student interests.

Many organization are associated with special academic and professional disciplines, such as foreign language clubs, the Architectural Society, the student affiliates of the American Institute of Architects, the American Chemical Society, and the student branches of the American Institute of Chemical Engineers, the American Institute of Physics, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Association for Computing Machinery, and the Institute of Electrical and Electronic Engineers.

The Rice Players is an extracurriculr theater group composed of Rice students and faculty. The Players present at least four productions each year. Recent productions include: Bertolt Brecht's *The Caucasian Chalk Circle,* Beth Henley's *Crimes of the Heart,*Peter Shaffer's *Equus,* and *Lysistrata* by Aristophanes. The Players welcome participation by anyone interested in any aspect of theater production or management.

Rice students are affiliated with a number of denominational religious organization. These include the Baptist Student Union, Canterbury Association, Christian Science Organization, Hillel Society, Lutheran Student Association, Newman Club, Intervarsity Christian Fellowship, and the Wesley Foundation. Many of these clubs are assisted by local clergy, who form the Joint Campus Ministry.

The Student Health Service

The Student Health Service fee, paid annually by undergraduate and graduate students, makes available to students both the Student Health Service and the Rice Counseling and Psychiatric Service. The care and services provided by the Health Service and the Rice Counseling and Psychiatric Service are described in information available from either Service or from the Office of Student Advising and Activities.

The Student Health Service is an outpatient primary care clinic located on campus in the north wing of Hanszen College. The clinic is staffed by two physicians and two nurses. Clinic hours are from 8:00 a.m. to 5:00 p.m., Monday-Friday through the undergraduate school year.

After hours and weekend medical care is provided by Park Plaza Hospital. For treatment in the emergency room at Park Plaza Hospital students must identify themselves as members of Rice University by presenting their Rice I.D. cards. Students should also have available medical insurance information. Students will be billed for services provided by Park Plaza. Students are responsible for all medical bills for blood test, X-rays, and physician care outside of the Health Service.

In serious emergencies call the Health Service (University extension x4966 during work hours), Campus Police (x3333), Houston Fire Department (227-2323), Park Plaza Hospital Emergency Room (527-5134).

The Health Service is open from the first day of Orientation Week until the day before Commencement. The Health Service is closed during the Christmas break and Thanksgiving and Easter weekends, but is open during mid-term breaks in the mornings only.

The Health Service provides the following:

1. Primary care for illness and injury with referral to specialist when needed.
2. Maintenance of health record for all students and administration of immunizations.
3. Contraceptive counseling and routine Pap Smears.
4. Administration of allergy injections with serum provided by student after specialist allergy work-up.
5. Physical examinations for employment, transfer to another school, scholarships expeditions.

Confidentiality. The Student Health physician/patient relationship and confidentiality is absolute, except where the individual student may be deemed a significant health risk to other students.

All Rice students are requested to have health insurance. Insurance may be purchased through the University at two levels of coverage, described in a brochure that is sent to incoming students each summer. Brochures and applications may also be obtained from the Cashier's Office or the Office of Student Activities and Advising. Rice's group coverage will be effective from 12:01 a.m., August 15, 1987, until 12:01 a.m., August 15, 1988. Dependent coverage is also available. If you have other medical insurance, a waiver card showing proof of insurance must be signed and returned to the Cashier's Office by August 15, prior to the beginning of classes, to avoid automatic billing for coverage.

The Rice Counseling and Psychiatric Service, which is staffed in cooperation with the Department of Psychiatry of the Baylor college of Medicine, provides help to students with many types of problems. The health fee includes this service although the Psychiatric Service is independent of the Student Health Service. Consultation and brief psychotherapy are available without additional charge. When it is clear that more prolonged counseling or treatment is necessary, the individual may be referred to a private physician or a clinic at his or her own expense or as covered by health insurance. An appointment may be made directly by a student either by phone or in person at the office of the Service. Provisions have been made for emergency situations that occur outside office hours. The confidential relationship between doctor and patient is carefully maintained as necessary for the effectiveness of the service.

Nonstudent spouses of students, both graduate and undergraduate, may participate in both Health Service and Psychiatric Service if they pay the health fee. The spouse must obtain an ID and have it validated through the Cashier's Office once the Health Service fee has been paid.

Brochures describing the Health Service, Psychiatric Service, and student health insurance are available in the Health Service Office, the Psychiatric Service Office, and in the Office of Student Advising and Student Activities.

The Fondren Library

The Fondren Library comprises more than 1,300,000 volumes plus 1,600,000 microforms and 11,500 serial titles in the fields of art, architecture, history, literature, music, philosophy, foreign languages, economics, social sciences, natural sciences, and engineering. The library is also a depository for United States Government documents and for United States patents, as well as a University affiliate for U.S. Census data.

The Fondren's open shelf policy enables students to locate materials easily and to browse through related volumes. Required and recommended library reading materials for courses are available in the Reserve Reading Room. The reference/collection development librarians provides assistance in the use of library materials and in computer searches of over one hundred subject data bases. Special facilities such as individual study carrels, group study rooms, audio-visual facilities, microform reading carrels, typewriters, and photoduplicating equipment are available in the library.

The Rice Memorial Center — Ley Student Center

The Rice Memorial Center, built through the generosity of friends and alumni, was dedicated on Homecoming weekend in the fall of 1958. The Ley Student Center was added through similar generosity and dedicated in the fall of 1986. The Rice Memorial Chapel is an integral part of the student center complex.

The Center serves as a gathering place for students and the University community, providing a variety of services, offices, and meeting facilities. The Rice Memorial Center houses the Association of Rice Alumni, Career Planning and Placement, the Food and Housing offices, the Rice Student Volunteer Program, the Rice Campus Store, Sammy's (snack bar and cafeteria), Willy's Pub and the MOB (Marching Owl Band). The Ley Student Center is the home of the Office of Student Advising and Student Activities, the Student Association, the Graduate Student Association, KTRU, the *Thresher,* the *Campanile,* the Rice Program council and various other student organizations.

The student center meeting facilities are available to the University community for meetings, parties, dinners, concerts, weddings, and special events. The Grand Hall, Farnsworth Pavilion, Brown Garden, Rice Memorial Chapel, Kelley Lounge, Ray Memorial Court, and conference rooms provide a variety of spaces for formal and informal meetings and special events.

Career Planning and Placement Office

The Career Planning and Placement Office offers career counseling, individually and in groups, to assist undergraduates, graduate students, and alumni in finding or changing employment. Placement facilities are available for the interviewing of students and alumni for prospective employment by representatives from business, industry, and schools. Representatives from universities and professional schools also interview candidates for advanced study.

Institute for Computer Services and Applications

ICSA, the Institute for Computer Services and Applications, operates the Rice University central computing facility, which supports many computing needs in the areas of education, research, and administration. Based in the new Seeley G. Mudd Building, ICSA provides diversified user services, approximately 80 terminals for direct computer interaction, and dial-up ports for telephone access. General services are available on the National Advanced Systems AS/9000-2, an IBM-compatible machine; specific educational services are supported on the Computer Science VAX/750s, while the Administrative Student Information Database is maintained on a PRIME 45. Other facilities, ranging from terminal clusters to small mainframes, are located throughout the campus.

Through course accounts, Rice students have access to a wide variety of languages and applications on the AS9000 and the Educational VAX computers. In addition, special student accounts are provided for educational computing not necessarily associated with course work. Popular applications include word processing, statistical analysis, graphics, and PASCAL programming.

Intercollegiate Athletics

A charter member of the Southwest Athletic Conference and a Division I member of the National Collegiate Athletic Association, Rice fields teams in football, basketball, baseball, track, swimming, tennis, and golf for men - -and in basketball, volleyball, track, swimming, and tennis for women. Home football games are played in the beautiful 70,000-seat Rice Stadium, and Autry Court for basketball and volleyball, Cameron Field for baseball, the Jake Hess Tennis Stadium and the Rice Track Stadium round out a complex of outstanding athletic facilities. Dedicated to the pursuit of high-level athletic goals for true student-athletes, Rice prides itself on its dual goal of excellence in both the

academic program and the athletic arena, and refuses to use the rigors of either as an excuse for less than high quality performance in the other.

Intramural Sports

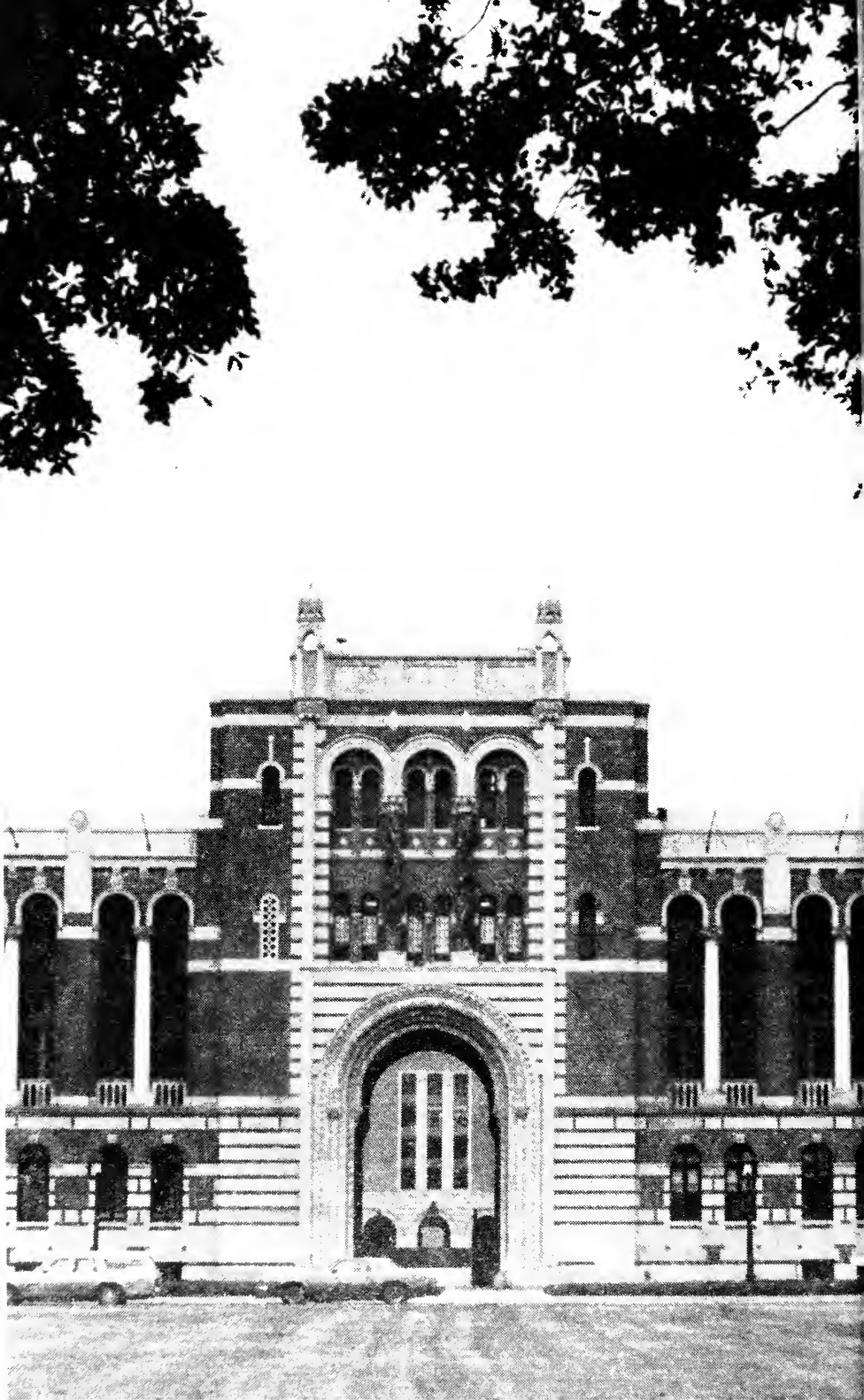
The Department of Health and Physical Education offers a supervised program of intramural sports for all students. An individual may participate in individual, dual, and team sports. Any interested students may form teams for the wide variety of tournaments. A student must compete in the University intramural tournaments to become eligible to represent his/her college in the college team sports tournaments to become eligible to represent his/her college in the college team sports tournaments which follow the open tournaments. In the past few years, over 4,000 entries from the student population have participated in 40 tournaments. (Students participate at their own risk.)

Sports Clubs

The Department of Health and Physical Education administers a Sports Club Program. A sports club is a special interest group organized to engage in and promote interest in a recreational physical activity. Clubs are organized in bowling, cycling, fencing, lacrosse, martial arts, rifle and pistol, rugby, soccer, sailing, volleyball, ultimate frisbee, and water polo. These groups are formed to increase individual and team skills through a continuing instructional and competitive program. Club activities are supported by individual contributions, membership dues, University funds, and fund-raising activities. (Students participate at their own risk.)

Student Automobiles

All student automobiles must be registered with the Traffic Division of the Rice University Police Department. Students must park in assigned areas and observe University regulations, subject to tow away and/or fines assessed by the University. Copies of the University Traffic and parking Regulations, which detail student privileges and responsibilities, may be obtained from the Traffic Division of the University Police.



Information for Graduate Students

Since the opening of the University in 1912, the importance of graduate study and research as a principal means of advancing knowledge has been recognized. The first Doctor of Philosophy degree was awarded in 1918 in mathematics. Since that time, the graduate area has been expanding through the basic sciences, the humanities, engineering, the social sciences, architecture, music, and administration and includes interdepartmental areas. The number of graduate programs has steadily increased, and advanced degrees are now offered in 33 fields of study.

Graduate programs are of two types, research and professional. Research programs lead to the Doctor of Philosophy, Doctor of Architecture, Master of Arts and Master of Science degrees. Professional programs provide advanced course work in scientific disciplines, but do not generally include independent research. They lead to the degrees of Doctor of Musical Arts, Master in Applied Mathematical Sciences, Master of Accounting, Master of Architecture, Master of Architecture in Urban Design, Master of Arts in Teaching, Master of Business Administration (which includes public and nonprofit management), Master of Chemical Engineering, Master of Civil Engineering, Master of Computer Science, Master of Electrical Engineering, Master of Environmental Engineering, Master of Environmental Science, Master of Materials Science, Master of Mechanical Engineering, Master of Music, and Master of Statistics.

All degrees conferred by the University are awarded solely in recognition of educational attainments.

Research Degrees

The degree of Doctor of Philosophy is awarded for original studies in accounting, anthropology, biochemistry, biology, chemical engineering, chemistry, civil engineering, computer science, economics, electrical and computer engineering, English, environmental science and engineering, French, geology, German, history, linguistics, materials science, mathematical sciences, mathematics, mechanical engineering, philosophy, physics, political science, psychology, religious studies, and space physics and astronomy. In architecture, the equivalent degree is the Doctor of Architecture. These degrees are awarded after successful completion of a program of advanced study and an original investigation reported in an approved thesis. As final evidence of preparation for this degree, the candidate must pass a public oral examination.

The degree of Master of Arts is available in the various humanities listed above plus art history and Spanish and in scientific fields of study, including the social sciences. The Master of Science degree may be obtained in the fields of chemical, civil, electrical and computer engineering, mechanical engineering, computer science, environmental science

and engineering, materials science/engineering, and space physics and astronomy. The Master of Architecture, Master of Architecture in Urban Design, and Master of Music are also offered as research degrees, with a thesis option.

The Master of Arts or Master of Science degree, or the Master of Architecture or Master of Music research degree, may be awarded after completion of at least 30 semester hours of study, including the thesis, 24 of which must be done at Rice. The residency requirement (full-time study at the University) is one semester. Programs generally include original work embodied in a thesis, and the candidate's preparation is evidenced by a public examination. Most students require three or four semesters to complete such a program, although some programs may be longer. In many departments, students may be awarded a master's degree on the basis of achieving candidacy for the doctoral degree. Such an award must be approved prior to April 1 of the year in which the degree is to be awarded.

Foreign language requirements for the master's and doctoral degrees are established by the individual departments according to the need for foreign languages in the conduct of research and scholarship in their respective fields.

Information on candidacy, the oral defense of thesis, and thesis regulations is given under Academic Regulations, beginning on page 000. More specific information about requirements for advanced degrees in each field of study is given under department headings in the section of the catalog which begins on page 000. Additional material may be obtained from the appropriate department chair.

Professional Degrees

Rice University offers several advanced degree programs which prepare students for positions in fields such as accounting, business administration, public and nonprofit management (see accounting and administrative science) architecture, mathematical sciences, computer science, engineering, and secondary education; in some departments, such degrees prepare the student for a doctoral level program. In addition, a non-thesis Doctor of Musical Arts degree is awarded after completion of a program of advanced study and required performances or original compositions. (If the field of emphasis is composition, a major work is presented as a thesis.)

Requirements for these degrees include the successful completion of 30 semester hours or more of advanced courses (numbered 300 or higher). At least 24 of these 30 hours must be taken at Rice. Additional information is presented in this catalog under the departmental listings in the Courses of Instruction section and in the Academic Regulations section, beginning on page 121. In each case, application materials are available from the department.

Accounting and Administrative Science

The Jesse H. Jones Graduate School of Administration offers two professional degrees, the Master of Business Administration (which includes a concentration in public and nonprofit management) and the Master of Accounting. Completion of either professional degree program requires two academic years. To qualify for either degree, the student must maintain a "B" (3.0) average and may be required to pass a special examination during the last semester in residence. There is no thesis requirement, although there is a thesis option in the Master of Accounting degree.

Applicants must submit scores on the Graduate Management Admission Test (GMAT), all college transcripts, and three letters of recommendation, as well as specified essays. Admission to the Jones Graduate School is open to undergraduates from Rice and

other universities, regardless of undergraduate major, but is highly selective and limited to those who have performed with distinction in their previous academic work and on the GMAT. No specific undergraduate course work is required for admission to either master's degree program. However, undergraduates contemplating graduate work in accounting or administrative science are encouraged to take course work in accounting, microeconomics, and computing. College mathematics through calculus is helpful. The Jones Graduate School offers an accelerated degree plan, known as the "3/2" program for highly qualified undergraduates. Under the "3/2" plan, a student may enter the Jones Graduate School at the end of his or her junior year; normally all the undergraduate major requirements must have been completed by that time. Ordinarily, the bachelor's degree is awarded at the end of the fourth year, and the master's degree at the end of the fifth year. The application process is the same for a "3/2" applicant as for a regular applicant. A "3/2" applicant from a school other than Rice, however, must insure that his or her academic institution will accept Rice graduate course credit for transfer to the bachelor's degree program.

Architecture

Degrees of Master of Architecture and Master of Architecture in Urban Design are offered. Completion of either degree requires two or more academic years. An applicant for admission should write to the Dean of the Rice University School of Architecture for specific information about the program for which the applicant would be qualified by education and experience. Completed application materials include the Rice University Application for Graduate Study form, transcript(s), Graduate Record Examination scores, a portfolio of the applicant's work, and a minimum of three letters of recommendation.

Computer Science

The Master of Computer Science degree requires completion of ten advanced courses approved by the Department of Computer Science, in accordance with general practices stated under Engineering, below. The program for each student is formulated in consultation with a departmental adviser. The areas of concentration are algorithms, compiler construction, operating systems, and programming languages.

Education

The Master of Arts in Teaching is a professional degree program for students wishing to qualify for secondary school teaching following a liberal undergraduate education. The program normally requires completion of 11 advanced courses with grades of "B" or higher. All courses must be approved by the Department of Education.

Admission requires that the applicant have a bachelor's degree, scholarly ability and motivation, and an interest in teaching at the secondary school level. Each applicant will be expected to take the Aptitude Test of the Graduate Record Examination. Applications are reviewed by members of the Rice University Teacher Education Council. Other requirements for the Master of Arts in Teaching are found in the Department of Education section of the Courses of Instruction listing.

Students in the program are not normally eligible for Rice University Graduate Fellowships or scholarship support since cooperating school districts pay students a salary for internship teaching. However, a limited number of tuition waivers may be available.

Engineering

Non-thesis master's degrees are offered in the branches of engineering listed below. A completed bachelor's degree in a relevant field is required for admission. Candidates are required to complete 30 hours of approved advanced courses (numbered 300 or higher). These advanced courses include at least four at the 500- or 600-level, indicating professional study in depth of a particular area. Courses counting toward these 30 hours may not be taken on a pass/fail basis. The student's major department must approve the overall program, and any departure from these guidelines must be approved in the Graduate Office.

Chemical Engineering. Flexibility in course planning permits specialization in such areas as economics, biochemical engineering, reservoir engineering, process control, optimization and systems analysis, applied mathematics, materials science, kinetics, and catalysis.

Civil Engineering. The area of concentration is structures and mechanics. Some specialization in solid mechanics, geotechnical engineering, or applied mathematics is possible within the structures and mechanics concentration.

Electrical and Computer Engineering. Technical electives permit some specialization in the general areas of bioengineering, communication and control theory, electro-optics and physical electronics, and computer science and engineering.

Environmental Science. Major emphasis of the degree program is in the areas of environmental biology, environmental chemistry and toxicology, surface and ground water hydrology, water pollution control, environmental geology, and environmental planning.

Environmental Engineering. Major emphasis of the degree program is in the areas of hydrology and water resources engineering, water and wastewater treatment design and operation, water pollution control, and numerical modeling.

Materials Science and Engineering. The student takes an approved program of courses in materials science and engineering or related fields plus two appropriate electives. Students may enter this degree program following undergraduate preparation in any of a number of related fields in addition to materials science/engineering.

Mechanical Engineering. Flexibility in course requirements permits specialization in thermal sciences and energy conversion, gas dynamics, hydrodynamics, computer-aided design, stress analysis and mechanical behavior of materials, and aerospace engineering.

Mathematical Sciences

The Master in Applied Mathematical Sciences degree requires satisfactory completion of 30 semester hours of approved course work beyond a bachelor's degree in an appropriate field. Concentrations are possible in numerical analysis, operations research, and physical mathematics. Candidates for admission are evaluated on their previous academic records and their potential for success in and benefit from the professional program.

Music

The Shepherd School offers the Master of Music degree in the following areas: composition, choral and instrumental conducting, historical musicology, performance, and music theory. An audition is required as part of the admission process for instrumental and conducting applicants. Composition majors are required to submit a portfolio of their works, and musicology and theory majors should submit samples of their written work. The Graduate Record Examination (both the Aptitude and Advanced Music Tests) is required of musicology, theory, and composition majors. The faculty of the Shepherd School may determine that additional work at the undergraduate level is needed.

The precise minimum hourly requirements for the Master of Music degree vary from 43 to 57 according to major area. For a description of the requirements for the Master of Music degree, see Music in the Courses of Instruction section.

The Doctor of Musical Arts degree, offered in selected areas, requires 90 hours beyond the bachelor's degree. For further information on the DMA program, write to the Shepherd School of Music, Graduate Admissions.

Statistics

The Master of Statistics degree requires satisfactory completion of ten approved courses. Study is in the fields of applied probability, biomatematics, data analysis, density estimation, epidemiology, image processing, model building, quality control, statistical computing, stochastic processes, time series analysis.

Interdisciplinary and Cooperative Programs

Interdisciplinary Graduate Programs. Opportunities are available for interdisciplinary study in various aspects of systems theory, solid-state electronics, materials science/engineering, and bioengineering. For applications or additional information, contact the chair of one of the participating departments as follows: for systems theory, the Department of Chemical Engineering, Economics, Electrical and Computer Engineering, or Mathematical Sciences; for solid-state electronics and materials science/engineering, Chemistry, Electrical and Computer Engineering, Mechanical Engineering, or Physics; for bioengineering, Chemical Engineering, Electrical Engineering, or Mechanical Engineering.

Joint Graduate Programs with Medical Colleges. Joint programs with the Baylor College of Medicine and the University of Texas Medical School are designed to provide educational experiences of high quality leading to research careers in medicine. These programs lead to joint M.D./Ph.D. or joint M.D./M.A. or M.D./M.S. degrees. Such programs can be worked out individually through various departments.

Joint Graduate Programs in History and Law. This selective program combines graduate work in legal and constitutional history at Rice University with professional work in law at the Bates College of Law, University of Houston, or at the Thurgood Marshall School of Law of Texas Southern University. Students in their first or second year of law school may apply for admission to Rice through their law school. Participants spend one year at Rice in the Master of Arts program concentrating on legal and constitutional history. After completing this year of residence and all requirements for the M.A. except the thesis, the student returns to law school to finish his or her legal studies. During the last year of law school, the student completes a suitable M.A.-level research thesis on a topic in legal and/or constitutional history selected with the approval of the law school

instructor and the student's Rice history adviser. The student who completes this program receives a law degree from his or her law school as well as an M.A. in history from Rice.

Joint Graduate Program in Medical Ethics. Under an agreement with the University of Texas Health Science Center at Houston, a cooperative program of graduate study in medical ethics is offered, leading to the M.A. and Ph.D. degrees in religious studies from Rice University. Also, under an agreement with the Baylor College of Medicine and the Institute of Religion, a cooperative program in medical ethics is offered, leading to the M.A. and Ph.D. degrees in philosophy from Rice.

Rice Center. Rice Center is an off-campus, not-for-profit research organization affiliated with Rice University. Its purpose is to facilitate research and dissemination of knowledge regarding the planning, financing, and operation of communities. Its full-time research staff of 32 conducts research in the areas of real estate, regional economics and demographics, transportation, and public services/community impacts. Rice Center offers opportunities for applied interdisciplinary research to students and faculty from the schools of Administration, Architecture, and Social Sciences.

Non-degree Programs

Students with a "B" (3.0) or better grade average with an undergraduate or graduate degree from an accredited college or university may apply for admission as non-degree (also known as Class III) students to take courses for credit without being admitted to a specific degree program. Permission of the instructor and an official admission by the Provost are required. Courses taken under this arrangement cannot be used to fulfill the requirements for an advanced degree at Rice until the student has applied to the appropriate department, been recommended for admission and been officially admitted by the Graduate Council, and then they can be counted only upon departmental recommendation. Normally, no more than three courses taken as a non-degree student can be applied toward a graduate degree. Non-degree students cannot take courses on a pass/fail basis. Applications for admission as a non-degree student should be submitted to the Office of Continuing Studies.

Admission to Graduate Study

Graduate study is open to well-qualified students who possess adequate background in the field of study they wish to pursue. Normally, but not always, the equivalent of an undergraduate major in the field is required, but the final judgment of preparation rests with the department concerned. The emphasis is on the quality of the applicant's preparation rather than on the academic program pursued or credits earned in achieving it.

Applicants for admission to graduate study should address all communications to the chair of the appropriate department, who will provide the application form and relevant information about the program. The completed form, with transcript and recommendations, should be returned to the department chair. Scores on the aptitude portion of the Graduate Record Examination (or the Graduate Management Admission Test), and an appropriate advanced test if required by the department, should be sent directly to the

Office of Graduate Programs. The general application deadline for the following academic year is March 1. However, some departments specify an earlier deadline, and departments may occasionally be able to consider late applications. Therefore, specific inquiries should be directed to the department.

Candidates are evaluated on their previous academic records, available test scores, and letters of reference from scholars under whom they have studied. Additional evidence of qualification to pursue advanced study, such as writing samples, portfolios, or statements of purpose, may be required. In addition to any specific requirements of the department, the applicant is expected to have at least a "B" (3.0) average in undergraduate work and high scores on the Graduate Record Examination (or GMAT). Initial decisions regarding admission or denial are made by departmental committees, which send recommendations accordingly to the Office of Graduate Programs for review. Official offers of admission may be made only by the Provost.

Graduate programs at Rice are designed for full-time study, but a limited number of students may be admitted on a part-time basis if the department recommends making such an exception, and if the Provost approves.

Each graduate student is advised by the departmental chair or an officially designated faculty member in planning the initial semester of graduate study. As soon as possible, each student should affiliate with a faculty advisor who will help plan both the course program and the thesis or special report.

Academic Regulations

Residency. The minimum residency (i.e., period of full-time study at Rice) is one semester for the M.A. or M.S., and four semesters for the doctorate.

Leave of Absence. Leave of absence is granted only by the Graduate Office upon the recommendation of the department, and is granted only to graduate students in good standing with the University. Leave must be approved in advance of the academic semester in question; it will not be granted after the student has registered for courses or after the registration period has passed. Normally, leave of absence is granted for no more than two consecutive semesters. No work toward a degree may be done at Rice or involve Rice faculty (or facilities) during a leave of absence.

Minimum Registration. Except for Degree 798 ("Degree Candidates Only") registration in the final semester when all requirements have been completed earlier, the minimum number of hours for which a student may register is three.

Courses of Study. Graduate students may register for courses of study only with the approval of their departmental advisors or chair. Similarly, students are allowed to drop or add courses only if departmental approval has been given.

Full-time Status. Graduate programs at Rice generally require full-time study. The semester course load for full-time students is nine hours or more, as required by the department. Full-time students may accept other employment only with the approval of the department and the Graduate Office. Students who are employed elsewhere in a full-time or virtually full-time capacity are not normally eligible for full-time status at Rice.

Part-time Study. Part-time students are occasionally admitted by special permission, usually for non-thesis programs only. Departmental recommendation is required. Students enrolling for nine semester hours or more will be considered full-time, and full-time tuition will apply.

Pass/Fail Option. Graduate students may take courses on the pass/fail basis only with departmental approval. All other restrictions regarding the pass/fail option, as stated

on page 69, apply equally to graduate students. Class III students may not take courses pass/fail.

Grade Standards. Students must achieve at least a B- (2.67) average on the courses counted toward a graduate degree. This is a minimal requirement; some departments have more stringent standards. Grade point averages are computed as shown in the undergraduate section of this catalog, on page 71.

Probationary Status. A graduate student is considered to be on probationary status whenever the cumulative GPA, or the GPA for one semester, falls below 2.33. Some departments may have more stringent standards. In most cases, the student's department will send the student a letter of warning. However, the probationary status applies whether or not such a letter has been issued. A second semester of probationary status will lead to dismissal by the Graduate Office unless a plea for exception is presented by the student's department and approved by the Graduate Council. A student may be dismissed by departmental action after only one semester of performance at the probationary level. (For other causes, see below.)

Dismissal. A graduate student may be dismissed from a program either for reasons of unsatisfactory progress or for reasons of behavior judged by the University to be disruptive or otherwise contrary to the best interest of either the University or the student.

Calendar Deadlines. Graduate students are expected to observe deadlines, such as for adding and dropping courses, as stated in the academic calendar.

Continuous Enrollment, Readmission. Graduate students are expected to maintain continuous involvement and enrollment, unless official leave of absence has been granted. Failure to register for any period without a leave of absence granted by the Graduate Council constitutes a *de facto* withdrawal. If the student later wishes to resume study, reapplication is required. Readmission is given only on the recommendation of the department and the approval of the Graduate Council. A readmission fee of $100 is charged, plus payment for up to two missed semesters.

Departmental Service. In most research degree programs, graduate students are assigned a limited amount of teaching or other departmental service as part of their training. The assignment should not entail more than ten hours per week, averaged over the semester, and will not be required for more than eight semesters.

Approval of Candidacy. A student seeking a master's or doctoral degree must submit a petition through the departmental chair to the Graduate Council for the approval by the Provost. The chair must certify that the applicant has fulfilled the departmental requirements and provide a transcript or other evidence that the work within the department is of high quality. The final oral examination in defense of thesis can be given only after the candidacy has been approved by the Graduate Council. Applications for approval of candidacy for the doctoral degree must be filed in the Office of Graduate Programs prior to November 1 and for the master's degree prior to March 1 of the academic year in which graduation is expected. The approval is valid for two years for the master's degree and four years for the doctoral degree. A student must have been approved for candidacy for the doctoral degree before the beginning of the ninth semester of residency at Rice to be eligible for continued financial support.

Oral Examinations, Thesis Committees. A committee for the oral examination, known as the thesis committee, is approved by the Provost at the time candidacy is approved. A thesis committee is composed of at least three members, of which two, including the committee chair, must be members of the department. In the case of a doctoral committee one member must be from another department. At least three members, including the chair, must be tenured or tenure-track members of the Rice faculty. The committee chair need not be the thesis director, but must be tenured or a tenure-track member of the major department.

Candidates are responsible for informing the members of their committee of the nature of the research and its progress; the members of the committee should review and approve the thesis in preliminary form before March 15 in order for the candidate to be

eligible to receive the degree in the May commencement. The oral examination may be scheduled at any time after the approval of candidacy, prior to the beginning of examination week in either semester. For the doctoral degree, the examination must be announced in the University Calendar at least one week in advance. In appropriate circumstances, an oral examination for the Ph.D. may be scheduled during the summer, and the posting of notice of the time and place on the bulletin board of Fondren Library the preceding week is acceptable as the public announcement. For the master's degree, public notice of the oral examination should be posted on the departmental bulletin board one week in advance.

The length of the examination and the character of the subject matter on which the candidate will be examined are left to the judgment of the committee. Should the candidate fail, the chair may schedule a second examination. In the event of a second failure, the student is required to withdraw from the University. Following the successful passing of the oral examination in defense of the thesis, two copies of the thesis must be submitted to the Office of Graduate Programs no later than one year from the date of the examination.

Students who pass the oral examination in defense of thesis on or before the first day of classes of the fall semester do not have to register for that semester even though work on the final copy may be continuing. They must register for Degree 798 in the spring in order to receive the degree.

Thesis Regulations and Procedures, The thesis, which is the principal record of work for an advanced degree, will be permanently preserved in the library. Directions for standard thesis form, which must be followed in detail, are provided by the Office of Graduate Programs upon approval ol candidacy. Students submitting a dissertation for the Doctor of Philosophy, Doctor of Architecture, or Doctor of Musical Arts degree must fill out a Survey of Earned Doctorates form. All students submitting theses, whether for master's or doctoral degrees, must complete a University Microfilm contract. Fees for the microfilming and binding of the thesis are to be paid to the cashier prior to submission of the two copies for approval. The deadline for submission of the thesis to the Office of Graduate Programs is noon of the next-to-the-last Friday preceding commencement.

Tuition, Fees, and Expenses

Tuition and fees for graduate students given here are for academic year 1987-88 only and are subject to change in subsequent years as the operating expenses of the University change.

Tuition for full-time students enrolled in the graduate division is $4,900 per year ($2,450 per semester) for all students through four or six semesters, as indicated below. In addition, each full-time graduate student pays a health service fee of $123.20 per year ($61.60 per semester), a Graduate Student Association fee of $10 ($5 per semester) and an Honor Council fee of $1. After six semesters, students continuing any phase of their studies, including work on their dissertation, on or off campus, must be registered and are subject to a tuition fee of $300 per year ($150 per semester). Students who are admitted with a relevant master's degree enter the reduced-tuition category after four semesters.

Refer to page 82 for a discussion of health insurance charges.

Continuous involvement and enrollment are expected. Failure to register for any period without a leave of absence granted by the Graduate Council constitutes withdrawal. A reinstatement fee of $25 is required upon return after an official leave of absence. A readmission fee of $100, plus payment of the tuition for up to two missed semesters, is required upon readmission after previous withdrawal or failure to maintain active registration.

The fee for the preceptorship programs in architecture, music, engineering, etc., which involve approved supervised work off campus to be recorded on the student transcript, is $100 per semester. Full-time interns at the Rice Center or an approved alternate pay $500 per semester. Tuition for part-time and Class III students is $210 per semester hour plus $50 registration fee each semester; total not to exceed $2,450 for Class III students. Students taking nine hours or more must be considered full-time. No scholarship or fellowship support is available to part-time students.

Graduate students who have fulfilled all requirements for the degree sought, including the thesis and/or final public oral examination, not already registered under one of the categories above, must be registered in Degree 798, "Requirements complete—registering for degree only" for the spring semester in which the degree is awarded.

For an annual fee of $35, a graduate student may purchase admittance to all regularly scheduled athletic events. If married, a student may purchase a season ticket for a spouse at a reduced rate of one-half the regular price, provided the season ticket is purchased at the beginning of the fall term.

Fellowships, Scholarships, and Prizes

Memorial Fellowships, Honors, and Prizes. Provision is made for a variety of fellowships, scholarships, and prizes available to graduates of this and other universities. Memorial fellowships that have been founded and endowed by gift or bequest on the part of friends of Rice University provide stipends enabling the holders to devote their time to study and research in their chosen fields. There are also several industrial fellowships maintained by companies interested in the development of technical fields and the training of competent scientists, engineers, and business executives.

Persons desiring consideration for appointment as fellows should consult with the department in which they desire to do research. However, not all fellowships are available every year.

A partial list of graduate scholarships, fellowships, and awards includes:

Achievement Rewards for College Scientists (ARCS Foundation) Scholarships in Science and Engineering
Ora N. Arnold Fellowship for better understanding between people and governments of the United States and those of Mexico, the South American states, the West Indies, and the Philippine Islands
Nettie S. Autrey Memorial Fellowship in Science
Eleanor and Mills Bennett Fellowships in Hydrology
Ralph Budd Award for Research in Engineering
Samuel Fain Carter Fellowship in Economics
Robert L. Chuoke Award in Physics
Cities Service Research Fellowship in Geology
Continental Oil Company Fellowship in Geology
William Dunlap Darden Medal in Architecture
Environmental Protection Agency Fellowships in Environmental Science and Engineering
W. Maurice Ewing Fellowship in Marine Science
Exxon Fellowship in Geology
John W. Gardner Award in Humanities and Social Sciences
Louis J. Girard Foundation Fellowship for Opthalmic Research
William and Elva Gordon Scholarship in Space Physics and Astronomy
Patricia Roberts Harris Fellowships
Gulf Oil Company Fellowship in Geology

Karl F. Hasselmann Fellowship in Chemical Engineering
Marjory Meyer Hasselmann Fellowship in Chemistry
Fannie and John Hertz Foundation Fellowship in Applied Physical Sciences
Houston Gem and Mineral Society Fellowship in Geology
Houston Geological Society Outstanding Student Award
Houston Oil and Minerals Corporation Fellowship in Geology
Jameson Fellowship for American Decorative Arts
Captain Charles Septimus Longcope Awards in History
Edgar Odell Lovett Fellowships in Mathematics
Jermayne MacAgy Fellowships in Art History
Mrs. L. F. McCollum Fellowship
John W. Mecom Fellowship in Geology
Dr. and Mrs. Earl Douglas Mitchell Fellowship in German
Dr. and Mrs. Earl Douglas Mitchell Fellowship in Linguistics
William F. Marlar Scholarship in Space Science
National Institute of Health Fellowships
National Institute of Health Traineeships in Biology
National Science Foundation Graduate Fellowships
Pennzoil Company Fellowship in Geology
Petroleum Research Fund Fellowships of the American Chemical Society
Phillips Petroleum Company Fellowship in Chemistry
Zevi W. Salsburg Awards in Chemistry
Schlumberger Foundation Fellowship in Mathematics
Shell Fellowship in Physics
Robert Parker Shubinski Award in Civil Engineering
Sigma Xi Research Awards
John Stauffer Scholarship in Chemistry
Tenneco Oil Company Fellowship in Geology
Texaco Fellowship in Physics
Radoslav A. Tsanoff Fellowship in Philosophy
Richard B. Turner Memorial Awards in Chemistry
Union Oil of California Fellowship in Geology
Lodieska Stockbridge Vaughan Fellowship
Harry Weiser Awards in Chemistry
Wiess Fellowship in Geology
Robert A. Welch Foundation Predoctoral Fellowships
H. A. Wilson Award in Physics
Wray-Todd Fellowships in Natural Sciences

Scholarships and Prizes of the Jesse H. Jones Graduate School of Administration

Leo M. Acker Memorial Scholarship in Accounting
Alumni Award for Outstanding Academic Achievement
(cash award given to graduating student)
Alice Pratt Brown Scholarship Dean's Award for Academic Excellence
(cash award given at beginning of second year)
COMIT Scholarship in Management Information Systems
John J. Deering Loan Fund
Deloitte Haskins & Sells Award for Excellence in Accounting
(cash award given to graduating student)
Educational Foundation of Texas Society of Certified Public Accountants Excellence Award (certificate)

Entrepreneurship Prize for the Best Acquisition Proprosal (cash award given at the end of the year)
Entrepreneurship Prize for the Best Business Plan (cash award given at the end of the year)
Executive Development Loan Fund
David E. Farnsworth Scholarship
Financial Executives Institute Award in Administrative Science (cash award given to graduating student)
E.F. "Gene" Florian Scholarship in Administrative Science
Bernard Fuchs Scholarship
H.H. Galloway Award in Administrative Science (cash award)
Houston Business Forum Scholarship
Jones Scholar (certificate)
William H. and May F. Keenan Fellowship
Cooper M. and Zava Waldrop Lochridge Scholarship in Administrative Science
Management Simulation Award in Administrative Science (certificate)
Speros P. Martel Loan Fund
John T. McCants Scholarship in Accounting
Vernon F. "Doc" Neuhaus, Sr., Scholarship
Pannel Kerr Forster Award for Excellence in Taxation
Lorane T. Phillips Award for Excellence in Writing (cash award given to graduating student)
Robert E. Phillips Award for Excellence in Oral Presentation (cash award given to graduating student)
Prize-Winning Case Proposal in the Course 'Entrepreneurship' and the Enterprise Exchange (cash award given at the end of the year)
Rice Presidential Recognition Award (cash award given to entering student)
Rotan Mosle Loan Fund
Verne F. Simons Scholarship in Accounting
Wall Street Journal Achievement Award (one-year subscription to the *Wall Street Journal)*
M. A. "Mike" Wright Award (certificate)
Arthur Young Accounting Fellowships

Scholarships and Prizes of the Shepherd School of Music. See listing in the undergraduate section, pages 94, 95.

Rice Graduate Fellowships. Graduate students with high academic records and outstanding qualifications may receive assistance through awards of Rice University Fellowships. These appointments in most cases provide a stipend plus tuition for the nine-month academic period. Some research assistant positions or special fellowships may be available to provide support during the summer months. Appointees to any fellowship or research assistantship must be engaged in full-time graduate study. Particularly outstanding entering students may be nominated by their department for a Rice Presidential Fellowship or a Rice Presidential Recognition Award. Selections are made by the Graduate Council.

In some departments, Rice Teaching Assistantships may be available to qualified advanced (third- or fourth-year) students. If exceptional teaching ability has been demonstrated, a student may be appointed to a Teaching Associateship.

Eligibility for fellowship support is limited to five years of study for students seeking a doctorate or three years for students seeking a master's degree. However, in order to maintain eligibility in the fifth year, the student must have achieved candidacy. Doctoral students entering with a previously earned master's degree will be eligible for stipend support for a maximum of four years of study and must have achieved candidacy by the beginning of the fourth year.

Graduate Tuition Scholarships. Students whose previous records show marked promise but for whom no graduate fellowships are available may, especially in their first year of graduate study, be awarded full or partial graduate tuition scholarships without stipend. Graduate scholars must carry a full schedule of graduate work.

Scholarships which provide both tuition and stipends are also available for a limited number of graduate students who are participants in the Army or Navy ROTC programs. For information on these scholarships, contact the Departments of Military or Naval Science.

Financial Aid

A limited number of tuition grants based on financial need are available. Rice engineering students who have received financial aid from the University during their undergraduate years may apply for continuation of assistance as needed for the year of study for the professional master's degree.

The Office of Financial Aid at Rice University offers limited aid to graduate students in the form of loans and work to U.S. citizens, permanent residents, and refugees.

Guaranteed Student Loans (GSL) may be processed through Rice up to a maximum eligibility of $7,500 per annum. These are guaranteed by the State of Texas. Eligibility criteria are set by Rice University and the Texas Guaranteed Student Loan Corporation.

No interest accrues nor is payment required while a student is enrolled at least half-time at Rice or full-time in any eligible post-secondary institution or for six months after terminating attendance. Repayment begins after this period, including a 7 to 9 percent annual interest charge on the unpaid principal balance. Depending on the size of the total loan commitment, the repayment period may extend over as much as 10 years. A completed GSL application, with supplements and 1040s must be submitted to the Rice Financial Aid Office.

CAVEAT: If the student has prior undergraduate GSLs, it would be in his best interest to obtain additional loans from the same source. Deferment forms should be filed with the holders of undergraduate loans. This applies to those who are Rice graduates as well as students from other schools.

Supplemental Loans for Students (SLS) are available to graduate students. They may borrow up to $4,000 per annum to an aggregate of $20,000. The interest rate on SLS loans is a maximum of 12 percent per year on the unpaid balance of the loans. Ordinarily the first payment is due within 60 days of the date of disbursement. However, graduate students may defer payment of principal and interest until termination of enrollment.

A completed SLS application, with supplements, must be submitted to the Rice Financial Aid Office.

All students may work on campus but time is a a major factor. For most, 10 to 12 hours a week is a reasonable limit. College Work/Study is available to students who meet eligibility criteria set by the Federal Government. A Financial Aid Form (FAF) must be filed with College Scholarship Service (CSS), and earnings will be limited to the amount shown on the award letter.

Fellowship and scholarship recipients are selected by the individual departments, subject to the approval of the Office of Graduate Programs. Applications for such awards should be made directly to the department involved.

A Gulf Oil Corporation Foundation Loan Fund and the Benjamin S. Lindsey and Vesla Nobile Lindsey Memorial Loan Fund are also available to students who are working toward a degree to assist them in meeting educational expenses. The funds of this loan program are limited. Interested persons may contact the Financial Aid Office. Interested students wishing to apply for a loan under any of these loan programs should commence

application procedures the summer prior to the academic year for which they are seeking assistance. Detailed information and application forms are available in the Financial Aid Office.

An Emergency Loan Fund, originally provided through gifts from the Graduate Wives Club of 1972-73, the Graduate Student Association, and various faculty members, is available to help graduate students at Rice with short-term needs. Loans from this fund are limited to $150 and must be repaid within three months. In lieu of interest, a charge of $1 per $50 loaned is assessed to maintain the fund.

Graduate Student Life

Graduate Student Responsibility

Rice University encourages student self-discipline within the framework of its general objectives. Each member of the community is expected to govern his or her conduct by standards of good taste and ethical judgment and to exercise personal responsibility.

The University reserves the right to require the withdrawal of any students whose failure to accept responsibilities as evidenced by conduct or their scholastic achievements is considered detrimental to their own or the University's best interests.

The Honor System

Graduate students are expected to observe the provisions of the honor code. The provisions of the honor system are summarized on page 98.

Fondren Library

Fondren Library provides extensive resources for advanced study and research among its collections. Among the notable research collections are the Menil Collection in art and art history and the Nadler German language and literature collection, as well as strong collections in Austrian history and literature, architecture, engineering, American history, French literature, and the natural sciences.

The Woodson Research Center is the repository of the library's rare books, manuscripts, and University archives, including copies of all Rice University theses. Special collections, including Civil War imprints, Texana, eighteenth-century English drama, the papers and library of Sir Julian Huxley, as well as numerous literary and historical manuscript holdings are available for research at the center. Large sets of research materials such as Early American Imprints (all monographic works published in the U.S. before 1800), papers of a number of United States presidents, and newspapers are available in microform. Fondren's collections can be supplemented through interlibrary loan.

Borrowing for graduate students and faculty is facilitated through cooperative arrangements with local and regional libraries and through on-line access to national bibliographic resources. Fondren provides study carrels for graduate students and faculty.

Graduate Student Government and Organizations

All full-time graduate students are members of the Graduate Student Association, which is the sole organ representing the graduate students as a body. Part-time graduate students may become members of the association upon payment of the necessary fee. The

governing body of this organization is the Graduate Student Association Council, consisting of a chairman, a secretary, a treasurer, and a representative from each department offering graduate study. Graduate students also participate in University affairs through their representatives on many of the standing committees appointed by the president, such as the Graduate Council, the Research Council, and on various departmental committees as well.

The Graduate Student Association invites participation by all members in a variety of social activities.

Housing

The Rice Graduate House is located at the south edge of the campus at the corner of South Main and University. The facility offers rooms, either private or shared, community kitchens, a commons and meeting rooms, and free transportation to academic buildings. Graduate students may also apply for membership in the undergraduate residential colleges. Rooms and apartments are often available for rent within walking or bicycling distance of the campus. The Office of Student Advising Activities and the Student Association keep a record of rooms and apartments about which they have been notified, and the daily newspapers list still others. Incoming graduate students are advised to arrive in Houston several days early in order to find housing. Rooms in the Graduate House must be reserved on a space-available basis by July 15 for the fall semester.

The Student Health Service and Insurance

Graduate students pay the same health service fee as undergraduates. A primary care outpatient clinic, open weekdays through the undergraduate school year, is located on campus in Hanszen College. After clinic hours, medical care is available at Park Plaza Hospital emergency room and through the doctors at Park Plaza Hospital. Access to limited psychiatric consultation, including marriage counseling, is also available to graduate students through the Rice Counseling and Psychiatric Service. For more information, refer to page 101.

All Rice students are required to have health insurance. Insurance may be purchased through the University at two levels of coverage, described in a brochure that is available in the Cashier's Office and the Office of Student Adivising and Activities. Rice's group coverage will be effective from 12:01 a.m., August 15, 1987, until 12:01 a.m. August 15, 1988. Dependent coverage is also available. If a student has other medical insurance, a waiver card showing proof of insurance must be signed and returned to the Cashier's Office by August 15, prior to the beginning of classes, to avoid automatic billing for coverage.

Student Automobiles

All automobiles on campus must be registered with the Rice University Police Department. For more information, refer to page 00.

Courses of Instruction

Academic departments are listed in this section alphabetically (except for the engineering departments, which are grouped together), with complete lists and descriptions of courses. Most departments also give specific requirements for students both at the undergraduate and graduate levels. These statements are supplemental to the University degree requirements described on pages 54-68.

Beginning in 1978-79, major requirements for graduation were designated in semester hours instead of semester courses as previously given. Students enrolled at Rice in a degree program prior to or at the beginning of the fall semester 1978 had the option of completing University and major requirements for their degree according to either semester courses or semester hours. Students who entering after fall 1978 must fulfill the semester hour requirements. On the following pages, departmental requirements are given in semester hours (to include all courses, laboratories, and tutorial sections). The corresponding requirement in courses (which refers only to courses of three or more semester hours and does not include associated laboratories or tutorial sections of fewer than three semester hours that may also be required) is shown in parentheses.

Courses numbered below 300 are lower level or introductory courses. Those numbered 300 to 499 are designated as advanced courses. Advanced courses are open to first-year and second-year students with proper prerequisites and to graduate students on approval of the individual student's adviser. Courses designed for graduate students are numbered 500 and above. The methods of presentation and quality of work expected make them generally unsuited to undergraduate participation. Undergraduates are permitted to enroll in graduate-level courses only after consultation with their advisers and with the instructor of the course.

Figures in parentheses following the title of each course signify the number of class hours per week, the number of laboratory hours per week, and the credit in semester hours for the completed course, in that order. The letters "a," "b," and "c" following the course number indicate the semester in which the course is normally taught. Thus, History 201a is normally taught in the fall semester and History 202b in the spring semester. Biochemistry 400c is normally taught in the summer session. The notation "a,b" indicates a course that is normally offered both semesters, while "a/b" indicates a course which may be offered either in the fall or spring semester depending upon the demand.

Certain courses are dependent upon available faculty, student demand, or funding. Uncertainty about *when* or *whether* a particular course will be offered during 1987-88 is indicated by the designation "Not offered every year." Moreover, the faculty list preceding each departmental section is more accurate for the 1987-88 academic year since it cannot anticipate 1988-89 staff changes.

Course descriptions in this section illustrate topics within the subject matter of the courses. Topics actually covered in the courses may vary from the examples given. Courses are subject to cancellation or modification, but cancellation of a course after final enrollment occurs only in extreme circumstances.

Students may obtain more detailed information about courses from the Registrar's *Schedule of Courses Offered* published each year or from the instructor of the course.

Persons using this catalog to evaluate Rice University transcripts should refer to course titles and descriptions, rather than course numbers, to determine content because course numbers are occasionally changed.

Accounting and Administrative Science

The Jesse H. Jones Graduate School of Administration

Professor Bailar, *Dean*
Professors P.W. Bell, Bixby, J. Cooper, Dipboye, Glanville, Howell, R.N. Taylor, Tuggle, von der Mehden, Uecker, E.E. Williams, and Zeff
Adjunct Professors Blumberg and R.J. Stanton
Associate Professors Batsell, Dharan, Driskill, Hirschey, Kiepper, Napier, and Windsor
Adjunct Associate Professors Hatchett, Hewitt, Isgur, Loukissas, Moseley, Rosborough, and S.J. Singer
Assistant Professors Bridges, Hagigi, Polakoff, and W.R. Wilson
Adjunct Assistant Professors Brosch and Flatt
Lecturers L. Baker, Birdwell, Ellis, Gow, Hauser, McQuilkin, D. Ross, Steffey, Viebig, and Westheimer

Degrees Offered: Master of Business Administration; Master of Accounting; Ph.D. in Accounting

The Jesse H. Jones Graduate School of Administration was established in 1974 through a gift from Houston Endowment Inc. Interdisciplinary in nature, the School utilizes faculty of other University departments to augment its own still expanding faculty. The School is dedicated to providing unique educational opportunities for professional training in the fields of accounting, business administration, or public and nonprofit management for highly select graduate students. The curricula leading to the degrees of Master of Business Administration (which includes a concentration in public and nonprofit management) and Master of Accounting are designed to be distinctive in terms of scope, realism, and utility. The School also offers a Doctor of Philosophy in Accounting, in which students undertake highly individualized research studies under the direction of distinguished scholars. Financial aid is available for both master's and doctoral degree students.

Undergraduate Program. No undergraduate major is offered in the Jones Graduate School; however, such undergraduate courses as accounting may be used to fulfill major requirements in the interdisciplinary program in managerial studies. This degree program is described on pages 272-273.

Students admitted to the Honors Program in Managerial Studies may elect certain specified graduate courses in accounting and administrative science as part of their major requirements. In addition, the undergraduate major in managerial studies for Rice students admitted as seniors to the Jones Graduate School in the special "five-year plan" may be partly satisfied by course work taken for the Master of Business Administration degree.

Graduate Programs. The Jones Graduate School of Administration offers the Master of Business Administration and Master of Accounting degrees and the Doctor of Philosophy in Accounting. Applicants to these programs must submit recent scores on the Graduate Management Admission Test (GMAT), all official college transcripts, and three letters of recommendation. Foreign nationals whose native language is not English must submit recent scores on the Test of English as a Foreign Language (TOEFL). Application forms are available from and should be submitted to the Office of Admissions and Student Affairs, Jesse H. Jones Graduate School of Administration. Graduates from any university and from a broad range of undergraduate majors are considered for either professional program. Students enrolled in the Jones Graduate School represent a wide variety of undergraduate majors, including economics, managerial studies, mathematics, mathematical sciences, political science, history, languages, fine arts, natural sciences, engineering, and business administration. An accelerated "five-year" degree plan is available to exceptional students from Rice and other universities in which students may complete the master's degree by the end of five years of college study. Admission to the Jones Graduate School is highly selective and limited to those who have performed with distinction in their previous academic work and on the GMAT.

Undergraduates contemplating graduate work in administrative science are encouraged to take course work in principles of accounting, principles of microeconomics, and business data processing. College mathematics through calculus is helpful. However, no specific undergraduate course work is required for admission.

A minimum cumulative average of 3.0 (B) is required for graduation. This requirement applies to Jones Graduate School courses and to any other Rice University courses taken for the M.B.A. or Master of Accounting degrees. All courses taken for the degree (including courses taken outside the Jones Graduate School) will be counted in the GPA calculation.

Grades lower than C are not acceptable for credit towards graduation. Any time a student receives a grade lower than C, the course must be repeated if it is required for graduation. If a grade lower than C is received in an elective course, the specific course need not be repeated, but the credits must be made up.

A student with a cumulative GPA of 3.0 or higher is eligible to continue in the school and is eligible for graduation and for financial aid from Jones School sources. A student with a cumulative GPA lower than 3.0 will be placed on probation and may have financial aid terminated. A student will return to good academic standing, but will not necessarily receive financial aid, by achieving a cumulative GPA of at least 3.0.

A student is subject to academic dismissal if: (1) after attempted completion of at least 12, but fewer than 24 hours, the student's cumulative grade point average is below 2.90; (2) after attempted completion of at least 24 hours, but fewer than 40 hours, the student's cumulative grade point average is below 2.95; (3) after attempted completion of at least 40 hours, the student's cumulative grade point average is below 3.0 or the student attains a semester average of below 3.0 while on probation.

Any student who has completed 64 approved hours for the M.B.A. or 32 for the Master of Accounting degree, but has a cumulative average lower than 3.0, will not be permitted to graduate. Such students may, at the School's sole discretion, be permitted to complete additional approved course work in the subsequent 12 months in an effort to raise the cumulative average to 3.0. Students in this situation are also subject to academic suspension or dismissal.

A student who continues on probation in consecutive semesters is not eligible for scholarship support from the Jones Graduate School unless his or her most recent grade point average for the immediately preceding semester is 3.0 or above. Students who have been suspended may not be eligible for financial aid from Jones Graduate School sources upon their return to school.

In addition, students are expected at all times to maintain high standards of ethical and professional conduct. They are treated as professional colleagues and are expected to

behave accordingly. Failure to maintain such standards is grounds for disciplinary action, including dismissal.

Financial assistance by the Jones Graduate School is awarded only for a given semester or year. Continuation of assistance depends on satisfactory academic performance, professional behavior, and availability of funds.

Master of Business Administration (M.B.A.) The M.B.A. program seeks to prepare students for high-level management positions in business, government, and nonprofit organizations.

Completion of the M.B.A. degree requires a minimum of two academic years in residence at Rice and 64 credit hours. One year of this residence requirement may be completed prior to receipt of the bachelor's degree through the accelerated "five-year" plan for Rice undergraduates. "Five-year" students from other institutions must spend two academic years at Rice. No student can receive a Rice graduate degree without first or simultaneously receiving a baccalaureate degree from his or her undergraduate institution. Students from other institutions are responsible for transferring Rice credits to their undergraduate degrees. All courses must be approved by the Jones Graduate School.

The M.B.A. student must register for no fewer than 15 and no more than 17 credit hours. Any other registration requires special permission. All registration and drop/add forms require the signature of an adviser. Requirements are stated annually for each entering class.

Waivers, exemptions, and transfers of credit are solely the decision of the School. Required courses may be waived in exceptional cases where the student already has the equivalent preparation. The residence requirement is not necessarily reduced, but additional elective courses are made available.

The first year of the full-time program is completely required and consists of foundation courses including accounting, communications and computers, economics and marketing, finance, legal and governmental processes, organizational theory, and quantitative methods. The student must complete Administration 501, 502, 511, 531, 532, 541, 542, 561, 562; and Accounting 501, 502, 524. Courses in the first year serve as prerequisites for the second year required and elective courses. Prerequisite requirements are enforced. Exceptions are granted only upon written petition to the Curriculum and Standards Committee which advises the Dean; the Dean's decision must be appealed to the Graduate Council. Oral and written communications skills are emphasized in both years.

The second year features two case method courses on management strategy designed to integrate the foundations skills taught in the first year. The student must complete Administration 503, 504, 591, and 592, together with 24 credit hours of approved electives. Each student is required to complete at least one area of concentration consisting of no fewer than 12 hours of elective courses. No credit hour may be counted toward more than one concentration; no more than two concentrations may be declared. With the assistance of an adviser, each student selects courses to meet the student's goals and objectives. Most courses will be in administrative science or accounting, but they may also include graduate or upper level offerings in other departments. Concentrations are available in accounting, business entrepreneurship, finance, international management, management information systems, marketing, and public and nonprofit management. Course work in operations research is available through the Department of Mathematical Sciences for qualified students.

The **international management program** offers a set of elective courses in the political, economic, and legal aspects of multinational activities. Students ordinarily take Administration 571, 573, and 574. Students may take related courses in other departments. The international management program is particularly relevant for students with a strong background in foreign languages and cultures. Students lacking such a background are strongly advised to take additional time (including summers and possibly a third year) to acquire such skills. Language training does not qualify for graduate credit toward the M.B.A. degree.

The Jones Graduate School offers an area of concentration in **public and nonprofit management.** Students who wish to prepare for government or nonprofit service select, with the assistance of an adviser, a set of elective courses tailored to meet the student's career aims. Students may take related courses in other departments. The M.B.A. core curriculum is specifically designed to promote the transfer of management skills from the private to the public and nonprofit sectors. Students interested in **business entrepreneurship** ordinarily take no more than two of Administration 521, 522, or 525 together with related courses, particularly in finance and accounting.

Master of Accounting (M.Acco.) The Master of Accounting program prepares students for professional positions in public accounting as well as for a variety of senior financial positions in business and government.

Rice undergraduates may complete the Master of Accounting program in one year of graduate study if they have taken the following courses by the end of their senior year: Accounting 305, 411, and either 406 or 409; Economics 211, 212, and 370; Mathematical Sciences 376 and either Mathematical Sciences 280 or Psychology 339; and Political Science 309 and 310. Additional recommended, but not required, courses are Mathematical Sciences 381 and 480; Economics 375 and 448; and Psychology 101 and 231. No specific undergraduate major is required for entrance into the program.

Rice graduates and graduates from other universities, who have not satisfied the prerequisite courses (or their equivalents), may require two years (64 semester hours) to complete the program.

The Master of Accounting degree program requires a minimum of 32 semester hours, including the following courses: Accounting 502, 512, 513, 524, 527, 531, and 541; and Administration 501, 502, and 511. Completion of the program qualifies the student to take the Uniform CPA Examination (30 accounting hours in Texas).

All courses must be approved by the Jones Graduate School. Required courses may be waived in exceptional cases where the student already has the equivalent preparation. Waivers, exemptions, or transfers of credit are solely the decision of the School. The residence requirement is not necessarily reduced, but additional elective courses are made available. Requirements are stated annually for each entering class.

Doctor of Philosophy in Accounting. The Ph.D. program prepares candidates for teaching and research careers in accounting. The program, which emphasizes research, normally requires a minimum of three years of full-time residence work (two years of course work and one year of dissertation research and writing). A bachelor's degree is required for entry.

After a year of course work, a doctoral student must satisfactorily complete a research paper before continuing. The student must also successfully complete a comprehensive examination prior to undertaking dissertation research and writing. The student will be expected to undertake certain research and instructional obligations as part of the Ph.D. program.

Accounting

Accounting Courses

305a,b. Introduction to Accounting (3-0-3).
Survey of basic accounting theory and practice with emphasis on the primary problems of asset valuation and income determination. In addition to preregistration, students must sign a reservation list in 250 Herring Hall.

Mr. Dharan, Mr. Bell, Mr. Zeff

406b. Management Accounting (3-0-3).
Uses of accounting data to plan and evaluate long-run investment and financing decisions and short-run price, costing, output, and financing decisions of the business firm or public entity. In addition to preregistration, students must sign a reservation list in 250 Herring Hall. Prerequisites: Accounting 305, Economics 211.
Mr. Shields

409a. Corporate Financial Reporting (3-0-3).
Using a case and readings format, the course deals with controversial issues in financial accounting and the analysis and interpretation of companies' financial statements. In addition to preregistration, students must sign a reservation list in 250 Herring Hall. Prerequisite: Accounting 305.
Mr. Bell

411a. Asset Accounting (3-0-3).
Deals with the major questions of asset valuation and income determination in the context of accounting theory and the evolving financial, economic, and political factors which have shaped the extant standards. The standard-setting process is discussed. In addition to preregistration, students must sign a reservation list in 250 Herring Hall. Prerequisite: Accounting 305.
Mr. Zeff

497a. Independent Study (3-0-3).
Independent study on an approved project under faculty supervision. Enrollment by special permission.
Mr. Zeff

498b. Independent Study (3-0-3).
See Accounting 497.
Mr. Zeff

501a. Financial Accounting (3-0-3).
Introduction to accounting theory and practice with emphasis on the primary problems of asset valuation and income determination. Prerequisite: graduate standing.
Mr. Shields

502b. Managerial Accounting (3-0-3).
Introduction to accounting systems designed to facilitate internal decision-making evaluation and control by private and public organizations. Particular emphasis given to behavioral impact of alternative internal reporting schemes. Prerequisite: Accounting 501 and graduate standing.
Mr. Uecker

511a. Asset Accounting (3-0-3).
Deals with the major questions of asset valuation and income determination in the context of accounting theory and the evolving financial, economic, and political factors which have shaped the extant standards. The standard-setting process is discussed. Prerequisite: Accounting 501.
Mr. Zeff

512b. Equity Accounting (3-0-3).
Deals with the particular problems in the estimation of liabilities and stockholders' equity. The focus is both on accounting theory and on the financial, economic, and political factors that have shaped the extant standards. Prerequisite: Accounting 501.
Mr. Dharan

513b. Special Topics in Accounting (3-0-3).
Deals with the theoretical and technical problems of consolidations, branch accounting, interim reporting, foreign operations, and international accounting standards. Also introduces accounting for government and nonprofit organizations. Prerequisites: Accounting 511, 512.
Mr. Hagigi

524b. Managerial Accounting and Finance (3-0-3).
Relationship between economic and current value accounting concepts of income, investment, and financing decisions and their social consequences, and the framework of national economic accounts. Emphasis on capital budgeting and financial theory. Prerequisites: Accounting 501, Administration 531, 541.

Mr. Polakoff

525a. Competitive Use of Information Technology (3-0-3).
This course examines the use of information technology in competitive strategy. Prerequisite: graduate standing.

Mr. Tuggle

527a. Management Information Systems I (3-0-3).
Managerial needs and problems in use of information systems; business models, equipment selection, information systems management, and systems development. A semester project is required. Prerequisite: Accounting 501.

Mr. Napier

528b. Management Information Systems II (3-0-3).
Concepts related to systems analysis, design, development, and implementation. Information needs for management and decision support systems are stressed. A semester project is required. Prerequisite: Accounting 501.

Mr. Napier

529b. Decision Support Systems (3-0-3).
Problems and approaches associated with designing decision support systems and integrating them into an organization's information system. Prerequisite: Accounting 501.

Mr. Napier

531a. Federal Taxation of Business Enterprises(4-0-4).
Theory of United States income taxation and its application to corporations, partnerships, and proprietorships; study of decision models involving tax structure and tax planning in business situations. Prerequisite: Accounting 501.

Mr. Viebig

532b. Federal Taxation of Individuals (3-0-3).
United States individual income taxation, including consideration of tax planning and tax-favored retirement plans. Prerequisite: Accounting 531.

Mr. Westheimer

534b. Special Topics in Taxation (Variable).
An examination of the theory and structure of federal estate and gift taxation, from both compliance and tax planning standpoints, and interrelated income tax planning, including income taxation of estates and trusts. Prerequisite: Accounting 531.

Mr. Viebig

536b. International Taxation (3-0-3).
Tax considerations involved in multinational operations.

Mr. Singer

541a. Auditing and Financial Reporting (3-0-3).
Auditing standards and procedures, statistical sampling applications, audit programs and reports, and professional ethics associated with the public accounting profession. Prerequisite: Accounting 512.

551a. Financial Accounting Practice (3-0-3).
Comprehension of FASB pronouncements on valuation, income, and cash flow concepts. Prerequisite: Accounting 512.

Mr. Hatchett

552a. Seminar in Accounting Theory (3-0-3).
Development of accounting theory in historical context, uses of accounting data in the decision-making process for managers and outside users, and consequent implications for the standard-setting process and public policy. Prerequisite: Accounting 511, 512. Not offered every year.

571b. Issues in International Corporate Reporting and Financial Management (3-0-3).
Uses the tools of economics and corporate finance to offer a conceptual understanding of international corporate reporting and financial management. Includes foreign exchange spot, forward, and futures transactions; foreign currency translations; international differences in financial reporting; and performance evaluation of foreign operations. Prerequisite: Accounting 501.
Mr. Hagigi

597a. Independent Study (Variable).
Independent study or directed reading on an approved project under faculty supervision. Enrollment by special permission.

598b. Independent Study (Variable).
See Accounting 597.

602b. Seminar in Accounting Research I (3-0-3).
Team-taught in a modular format, this seminar introduces areas of contemporary research in accounting. Prerequisite: admission to Ph.D. in accounting program. Not offered every year.

611a. Seminar in Accounting Research II (3-0-3).
Continuation of Accounting 602. Not offered every year.

612b. Tutorial in Accounting Research (3-0-3).
Intensive study in an area of accounting research in which the student expects to specialize. Prerequisites: Accounting 602, 611. Not offered every year.

800b. Thesis Research (Variable).

Administrative Science

Administration Courses

501a. Management Skills Seminar I (Variable).
Weekly seminar held each semester in which invited speakers discuss a variety of management topics. Basic oral and written communication, computer and managerial skills for first-year M.B.A. and M.Acco. students. Prerequisite: graduate standing.

502b. Management Skills Seminar II (Variable).
See Administration 501.

503a. Management Skills Seminar III (Variable).
Weekly seminar held each semester in which invited speakers discuss a variety of management topics. Advanced oral and written communication and managerial skills for second-year M.B.A. students. Prerequisite: Administration 501.

504b. Management Skills Seminar IV (Variable).
See Administration 503.

505a. Faculty Research Seminar
Faculty and invited guests meet periodically to present current research findings.
Mr. Uecker

506b. Faculty Research Seminar
See Administration 505.

Mr. Uecker

511a. Organization Theory (3-0-3).
Examines theoretical and empirical content of psychology applied in the organizational setting, the development of organization theory, current approaches to the study of complex organizations, and the operation of major types of complex organizations in both private and public sectors. Prerequisite: graduate standing.

Mr. Howell

518b. Managerial Decision Making (3-0-3).
Review of current theories of decision making in and by organizations. Emphasis on behavioral decision theory, human problem solving, and organizational processes. Prerequisite: graduate standing.

Mr. Taylor

521a. Entrepreneurship and the New Enterprise (3-0-3).
Characteristics of entrepreneurs, the economics of entrepreneurship, the role of entrepreneurship in economic growth, process of starting and managing a new business, venture capital, legal and tax aspects of new venture activities, and preparation of a business plan. Prerequisites: Accounting 524, Administration 541.

Mr. Williams

522b. Entrepreneurship and Enterprise Exchange (3-0-3).
How to negotiate, the "needs" approach to buying and selling a business, enterprise valuation, deal and contract structuring, corporate venturing, and special topics. Prerequisites: Accounting 524, Administration 541.

Mr. Williams

523a. Real Estate Development (3-0-3).
Identifies and analyzes real estate development opportunities. Prerequisite: Accounting 524.

Mr. Blumberg

524b. Real Estate Finance (3-0-3).
Examines financing aspects of real estate development. Prerequisite: Accounting 524.

Mr. Isgur

525a. Creative Entrepreneurship (3-0-3).
Conceiving ideas for new businesses and evaluating those ideas. Topics include fixed and variable costs of new businesses, the break-even point, how to raise capital, and finding and motivating employees. Six specific strategies for rapid growth in small- to medium-sized businesses are presented. Prerequisites: Accounting 524, Administration 541.

Mr. Gow

531a. Quantitative Methods I (3-0-3).
Use of statistical methods and computer systems to analyze decision problems, including product design as an illustration of marketing management. Prerequisite: graduate standing.

Mr. Batsell

532b. Quantitative Methods II (3-0-3).
Use of operations research methods and computer systems to analyze decision problems, with particular emphasis on production and operations management. Prerequisite: Administration 531.

Ms. Bridges

534b. Cases in Operations Research (3-0-3).
Applications of management science optimization techniques through modeling and solving of real-world cases involving distribution, financial, production, and manufacturing problems. Prerequisite: Administration 531.

Mr. Bixby

541a. Managerial Economics and Marketing I (3-0-3).
Long-run and short-run price and production decisions in private and public economic entities in the face of differing demand conditions and market environments; pricing and marketing strategies in these varying conditions. Prerequisite: graduate standing.
Mr. Hirschey

542b. Managerial Economics and Marketing II (3-0-3).
Marketing strategy and management in domestic and international markets; macroeconomics of business cycle fluctuations, fiscal and monetary policy, and international trade and finance. Prerequisite: Administration 541.
Mr. Wilson

543a. Capital Markets (3-0-3).
Financial environment of the corporation; use of money and capital market instruments; roles of intermediaries and institutions. Prerequisite: Accounting 524.
Mr. Polakoff

545b. Investments (3-0-3).
Investment policy for individuals and institutions, structure of rates in financial markets, investment timing and selection, principles of financial analysis of individual security issues, securities markets, valuation of securities, retention of portfolios. Prerequisite: Accounting 524.
Mr. Hirschey

546b. Corporate Financial Strategy (3-0-3).
Advanced financial topics of interest to the corporation: value creation, diversification, risk-benefit analysis, tax policy, present value. Emphasizes practical problems of the corporation. Prerequisite: Accounting 524.
Mr. Ross

547a. Financial Theory (3-0-3).
Underlying assumptions and maximization problems in finance; demand, supply, and cost for money capital; optimal capital structure and dividend policy; investment and financial equilibrium in a capital asset pricing world; disequilibrium and the real world. Prerequisite: Accounting 524. Not offered every year.

551a. Commercial Banking and the Entrepreneur (3-0-3).
Examines the highly competitive and dramatically changing national and international financial services markets. Utilizing visiting speakers, case studies, and a computer simulation, "Bank Presidents' Game," emphasis is placed on understanding the principles and concepts of bank management and operations within a complex economic environment. Special emphasis is placed on ways in which the entrepreneur selects, works with, and uses his/her bank. Prerequisite: Accounting 524.
Mr. Baker, Mr. Ellis

552b. Investment Banking (3-0-3).
Analysis of the characteristics of the investment banking industry, focusing on topics of corporate financial transactions: public offerings, private placements of debt and equity, and mergers and acquisitions. Prerequisite: Accounting 524.

560b. Law for Accountants (3-0-3).
Civil law, common law, equity, state and federal court systems, contracts, sales, bailments and carriers, bankruptcy, secured transactions, Uniform Commercial Code, and the Uniform Partnership Act. Prerequisite: graduate standing.
Mr. Friday

561a. Legal and Governmental Processes I (3-0-3).
Impact of government on decision making in business, featuring comparisons of governmental intervention across major industrial systems; analysis of environmental trends and public policy options. Prerequisite: graduate standing.

562b. Legal and Governmental Processes II (3-0-3).
Law as the medium in which American society and business function; legal history, jurisprudential bases, theory and practice of principal kinds of law: common law, statute law, constitutional law, and law of government control. Prerequisite: Administration 561.

563a. Public Administration (3-0-3).
The administration and implementation of public policies across federal, state, and substate governments. Prerequisite: permission of instructor. Also offered as Political Science 537.
Mr. Stein

564a. Public Financial Management (3-0-3).
Political, economic, and accounting dimensions of financial management in public and nonprofit organizations. Emphasis on budgeting systems, appropriations processes, cost-benefit analysis, taxation, pricing, fund accounting, debt management, financial administration. Prerequisite: permission of instructor or graduate standing. Also offered as Political Science 564.
Mr. Windsor

571b. Political Risk Analysis (3-0-3).
Analyses of political and social factors affecting business operations abroad, including domestic instability, foreign conflict, corruption, nationalization, indigenization, etc. A simulation exercise is required. Also offered as Political Science 571.
Mr. von der Mehden

573a. Global Strategic Management (3-0-3).
Changes in international competition, techniques for analysis of economic forces, changes in governance, and the concepts of competitive strategy and globalization of technology and the marketplace. Prerequisite: graduate standing.
Mr. Hauser

574b. Regulatory Law of Transnational Business Operations (3-0-3).
Topics in U.S. and foreign law as they relate to the law/business interface of importing/exporting/trade problems, foreign operations, foreign investment, extraterritorial impact of U.S. law, corporate organization, foreign exchange, joint ventures, withdrawal from foreign ventures, and third country manufacturing. Prerequisite: graduate standing. Not offered every year.

581a. Marketing Strategy and Management (3-0-3).
Introduces decisions, concepts, and methodologies which constitute the field of marketing. Places student in the decision-making role concerning product, advertising, pricing, promotion, sales force, and distribution decisions. Uses a case analysis format to illustrate strategic marketing and marketing management. In addition, students participate in a course-long marketing simulation. Prerequisite: Administration 542.
Mr. Wilson

582b. Marketing Research (3-0-3).
Emphasizes design, execution, and analysis of marketing research. Topics include experimental, survey, and questionnaire design, specification of sampling and coding schemes, and the application and interpretation of multivariate methodologies. Prerequisite: Administration 542.
Mr. Batsell

584b. Product Management (3-0-3).
Applies various dimensions of marketing strategy and management to role of product manager, who is responsible for all aspects of developing and marketing a particular product. Prerequisite: Administration 542.
Ms. McQuilkin

585a. New Product Marketing (3-0-3).
Introduces the student to all aspects of designing and marketing a new product. From techniques to stimulate creative thinking through the concept test and finally the new product introduction, the student is exposed to relevant concepts and methodologies that aid the marketer of new products. Prerequisite: Administration 542.
Ms. Bridges

586b. Marketing for Small Businesses (3-0-3).
Teams of students work throughout the semester with a small Houston business to develop a strategic marketing plan, including a market opportunity analysis and an analysis of the competitive structure. Prerequisite: Administration 542.
Mr. Wilson

588a. Management of the Advertising Function (3-0-3).
Focuses on the role and function of advertising, including management of the client-agency relationship, role of the advertising agency, and the role of advertising. Prerequisite: graduate standing.

Mr. Birdwell

591a. Management Strategy I (3-0-3).
Examination of managerial and organizational problems in the private and public sectors which illustrate fundamental principles of domestic and international management practice. This course integrates key managerial skills taught in other core courses. Extensive use of case materials, student presentations, and computer simulation. Prerequisite: Accounting 524.

Mr. Taylor

592b. Management Strategy II (3-0-3).
Continuation of Administration 591. Prerequisite: Accounting 524.

Mr. Williams, Mr. Windsor

593a. Topics in Management I (3-0-3).
Section 1: Production and Operations Management. Section 2: Health Care Systems. Prerequisite: graduate standing. Not offered every year.

Mr. Flatt, Mr. Moseley

594b. Topics in Management II (3-0-3).
Section 1: Public-Private Partnerships (also offered as Political Science 566). Section 2: Management of Technology (including professional and technical personnel). Prerequisite: graduate standing. Not offered every year.

Mr. Brosch, Mr. Loukissas, Mr. Hewitt

595a. Social and Ethical Responsibility of Business(3-0-3).
Examines the ethical dimensions of management, including the social responsibility of business. Theories and methods of ethical reasoning are considered. Prerequisite: graduate standing or instructor permission.

597a. Independent Study (3-0-3).
Independent study or directed reading on an approved project under faculty supervision. Enrollment by special permission.

598b. Independent Study (3-0-3).
See Administration 597.

Anthropology

Professor Marcus, *Chair*
Professors P.W. Davis and Tyler
Associate Professors Adair, Fischer, Maranhao, R.J. McIntosh, S.K. McIntosh, J. M. Taylor, and Traweek
Adjunct Associate Professors Gibson and Schreiber
Assistant Professors Biesele and Rasmussen
Lecturer Georges

Degrees Offered: B.A., M.A., Ph.D., B.A. in behavioral science

Undergraduate Program: Anthropology is a discipline that encompasses many subjects of study, all related to understanding human beings and their cultures. A student may organize a major in one or more of anthropology's principal fields or may combine a major in anthropology with one in another discipline. Students majoring in anthropology are required to take a total of 30 semester hours in anthropology (ten semester courses).

Majors must devise a plan of study in consultation with a faculty adviser. Although there are no required courses, students will be encouraged to gain exposure to all of the principal fields within anthropology (archaeology; biological, cultural, and linguistic anthropology). On declaring a major in anthropology, a student should meet with the departmental undergraduate adviser in order to tailor a major plan in line with the student's interests. This plan can be modified at any time with the approval of the adviser.

With departmental approval, a maximum of 6 semester hours (two courses) outside of anthropology but related to the student's plan of study may be substituted for hours/courses in anthropology. Majors who plan to pursue graduate training toward a career in anthropology will need a reading knowledge of one or two European languages and are urged to enroll in undergraduate language courses. These majors are also urged to apply for admission to the honors program.

Honors Program. The primary purpose of the Honors Program is to provide selected undergraduate majors with an opportunity to receive advanced training, particularly in the planning and execution of independent research, within their chosen areas of specialization in anthropology. A secondary purpose of the program is to establish an administrative framework for the formal recognition of outstanding students. Majors considering a career in anthropology are strongly encouraged to apply, as are all others who desire the experience of an intensive, individual research project as part of their undergraduate education.

Acceptance into the program is at the discretion of the anthropology faculty. A statement of eligibility requirements and program requirements is available in the departmental office.

Behavioral Science Major. The major in behavioral science centers on a nucleus of courses in anthropology, psychology, and sociology. The student ordinarily, but not necessarily, emphasizes one of these three fields.

Students majoring in behavioral science are required to take a minimum of 30 semester hours (ten semester courses) in anthropology, psychology, or sociology, of which 24 hours (eight courses) must be courses numbered 300 or higher. A minimum of 6 semester hours (two courses) in each of the three fields of anthropology, psychology, and sociology is required. With the approval of the major adviser, a maximum of six semester hours (two courses) in courses numbered 300 or higher in related fields outside the core fields may be included in the major. Six semester hours (two courses) at the 200 level may be substituted for advanced courses if they are in a field of the major in which no courses have been taken previously. Students are encouraged to plan in consultation with the program adviser an independent study course (to be taken in the fall of their senior year) that integrates the varying perspectives of anthropology, psychology, and sociology.

Graduate Program. The graduate program offers advanced training in social/cultural anthropology, biological anthropology, and archaeology, leading to a Ph.D. in anthropology. The M.A. is optionally offered upon approval of candidacy for the Ph.D. The M.A. as a terminal degree requires satisfactory completion of 30 semester hours of course work approved by an adviser, satisfactory completion of one of the special papers (see uniform requirements for the Ph.D.), and a thesis. Although there are uniform requirements for the Ph.D. degree, each field of specialization offers different opportunities for training and different topical research orientations reflecting the interests of the faculty. Consequently, the Department seeks applicants with a defined interest in one of the broad fields of specialization within anthropology. An undergraduate background in anthropology is desirable but not required for admission. In consultation with a major adviser and two other faculty members, each entering student is expected to design a flexible study plan that emphasizes broad training in a field of specialization and the eventual definition of a problem for dissertation research. All first-year students can usually be offered some form of support, ranging from full graduate fellowships, which provide tuition plus a stipend, to tuition scholarships only. When possible, these awards are renewed for the second year of study.

Specialization in Social/Cultural Anthropology. The faculty is eclectic in its interests, and the program offers exposure to styles of argument and reasoning across the range of contemporary theoretical issues in social/cultural anthropology. We emphasize the reading of primary sources of theory, which have inspired the discussion and definition of central problems within anthropology. In addition, as essential preparation for doctoral research, explicit attention in instruction is paid both to field work and to skills in the conception and writing of ethnography.

Specialization in Biological Anthropology. Training in biological anthropology emphasizes biomedical issues, including nutrition, growth and development, human adaptation, human genetics, and public health. Students may take advantage of the extensive resources of the Houston Medical Center through ties established with the University of Texas School of Public Health and Graduate School of Biomedical Sciences. In addition to work at Rice, degree credit may be given for both formal courses offered at the Schools of Public Health and Biomedical Sciences and independent study, tutorials, and research with adjunct faculty at these institutions.

Specialization in Archaeology. Training emphasizes research skills in the library, field, and laboratory, to be tested by means of the three required research papers, at least one of which must be an original data paper. In addition to research on the dissertation topic, all students are encouraged to develop at least one analytical skill — such as remote sensing, archaeological statistics, osteology, geomorphology, and pedology — making use of the excellent laboratory and computer facilities at Rice.

Uniform Requirements for the Degree of Doctor of Philosophy. Each entering student will devise a detailed first year plan of study and provisional plans for succeeding years in consultation with his or her advisers. Seminars and tutorials can be arranged on any topic relevant to a student's training, and where appropriate, these can be conducted in supervisory consultation with scholars in other disciplines at Rice as well as with adjunct faculty. During the first two years of study, each student will prepare three substantial papers, each emphasizing an analytical, research, and writing skill appropriate to the field of specialization. The subjects of the papers and their scheduling are major considerations in the ongoing consultations between students and their advisers. During the course of study, each student must demonstrate reading competency in one foreign language. Before advancing to Ph.D. candidacy, a student must prepare a satisfactory proposal for dissertation research. Following approval of the research proposal, a dissertation committee is appointed. Dissertations are ordinarily based in substantial part upon field research.

Anthropology Courses

200a. Language (3-0-3).
An introduction to the scientific study of language. The methods of linguistic prehistory. The language families of the world and the interrelationship of language and thought. Also offered as Linguistics 200.

Mr. Copeland

201a. Introduction to Social/Cultural Anthropology(3-0-3).
An introduction to the history, methods, and concepts of the disipline devoted to the systematic description and understanding of cultural diversity in human societies.

Ms. Biesele

202b. Introduction to Biological Anthropology (3-0-3).
The evolution, genetics, and adaptive significance of human biological differences. Includes an examination of the fossil record of human evolution as well as patterns of and explanations for variability in modern human populations.

Mr. Rasmussen

205a. Introduction to Archaeology (3-0-3).
Principles and methods of archaeology; an introduction to the elementary concepts of the discipline through a series of case studies.

Mr. McIntosh

224b. The Culture of Ancient Greece (3-0-3).
Readings from the tragedians, the poets, and the philosophers, emphasizing topics such as family life, sexuality, mental health, discourse, and communications. Summary of the prehistory and ethnology of the Greeks.

Mr. Maranhão

300b. Linguistic Analysis (3-0-3).
English and other languages as objects of scientific analysis. Phonological structure, morphology and syntax, semantic structures, and techniques of linguistic analysis. Also offered as Linguistics 300.

Mr. Copeland

301a. Phonology (3-0-3).
Theory and practice of articulatory phonetics and of methods of determining the structural patterns which underlie speech sounds. Also offered as Linguistics 301.

Mr. Copeland

305b. Historical Linguistics (3-0-3).
The nature of language change in its social and geographical contexts from the perspective of language acquisition. Also offered as Linguistics 305.

Mr. Copeland

306a. History of Anthropological Ideas (3-0-3).
An introduction to the history of anthropology, its theories, and methods. The emphasis is upon social and cultural anthropology.

Mr. Marcus

308a. History as a Cultural Myth (3-0-3).
Ideas of history and attitudes toward the past as culturally conditioned phenomena. Emphasizes history as statement of cultural values as well as conceptualizations of cause, change, time, and reality.

Ms. Biesele

309a. Cultural Studies of Science (3-0-3).
Analyzes several studies of laboratories and research groups around the world to investigate how culture impinges upon scientific activity. Evaluates key terms in the study of science and technology for their cultural assumptions by using those terms to explicate these laboratory studies. Discusses the design of ethnographic studies of scientific and technological laboratories.

Ms. Traweek

313a. Language and Culture (3-0-3).
Investigates the relation between language and thought, language and world view, language and logic. Also offered as Linguistics 313.

Mr. Tyler

314a. Orality, Literacy and Culture (3-0-3).
The study of sociocultural traditions based on their dominant mode of communication: oral, literate or electronic.

Mr. Maranhão

333b. Social and Cultural Theory (3-0-3).
British functionalism, analytic philosophy, French structuralism, neo-Marxism, phenomenology, hermeneutics, and ethnomethodology. An intensive review of the major sources of theory guiding research in contemporary anthropology. Strongly recommended for majors and for students in the humanities.

Mr. Fischer

336b. The Art of Ethnography (3-0-3).
A seminar that explores the experience of doing field work and the problems of transforming theory, field experience, and data into a written account. Emphasis is on reading field work accounts and gaining ethnographic writing skills. Strongly recommended for majors but also for other interested students in the social sciences and humanities.
Mr. Marcus

340a. Camera and Culture (3-0-3).
How photographs come to be produced and read as documentary evidence in science, law, history, anthropology and families. How photographs and photographic technology shape and are shaped by the cultures in which they are used as a case study in the relations between technology and culture.
Ms. Traweek

345a. The Person Across Cultures (3-0-3).
Course discussions and lectures will be built around the central issue of whether the "individual" or the "self" is uniquely an Euroamerican cultural ideal or whether it is universally an aspect of personhood in all cultures.
Mr. Maranhão

348a. America as a Culture (3-0-3).
Explorations in community studies, symbolic anthropology, literary criticism, religion, and politics.
Mr. Fischer

353b. Cultures of India (3-0-3).
Summary of the prehistory, ethnography, and ethnology of the Indian subcontinent. Special emphasis on Hinduism, Buddhism, and Indian philosophy.
Mr. Tyler

356b. Ethnography of Tribal People (3-0-3).
Some "people"—for example, the Nuer, the Samoans, the Australian aborigines, the Hopi and the Navajo—have been studied by anthropologists for decades and in a few cases almost a century. This course will review the studies for a particular people, discussing change and permanence in their anthropological description and other related issues.
Mr. Maranhao

362b. Archeological Field Techniques (3-0-3).
Methods used in field work, laboratory analysis, and interpretation of archaeological data from a local site excavated by the class. Prerequisite: Anthropology 205.
Mr. McIntosh

365b. Cultural Ecology and the Ancient Landscape(3-0-3).
Elementary fluvial and aeolian geomorphology of arid-lands floodplains and application of remote sensing and survey techniques to a series of ethnographic and archaeological research problems.
Mr. McIntosh

367a. Human Evolution (3-0-3).
Overview of the fossil evidence for human evolution, focusing on when and why our uniquely human characteristics appeared.
Ms. McIntosh

368a. Primatology (3-0-3)
This course is intended as an introduction to primate diversity, ecology, and sociality, based on what is now known from field studies of wild primate populations. Emphasis will be placed on the ecological significance of variation among species in diets, reproductive patterns, and demography.
Mr. Rasmussen

381a. Medical Anthropology (3-0-3).
Cultural, ecological, and biological perspectives on human health and disease throughout the world.
Ms. Georges

383a. Human Adaptation (3-0-3).
Explanations for the range and patterns of human biological differences in the context of theories of adaptation. Integrates themes from human genetics, physiology, and cultural studies.
Mr. Rasmussen

386b. Human Nutrition (3-0-3).
The anthropology of eating: nutrient requirements; assessment of nutritional status; food selection; symbolic, psychological, and cultural aspects of food and food consumption.
Ms. Georges

402b. Syntax and Semantics (3-0-3).
Study of semantic categories and their formal expression in morphological, syntactic, and lexical units and patterns. Also offered as Linguistics 402.
Mr. Davis

404a,b. Independent Study (Variable).
Directed reading and preparation of written papers on anthropological subjects not offered in the curriculum and advanced study of subjects on which courses are offered.

406b. Cognitive Anthropology (3-0-3).
Relations between thought, language, and culture. Special emphasis given to natural systems of classification and the logical principles underlying them.
Mr. Tyler

407a. Field Techniques and Analysis (3-0-3).
Techniques and practice in the observation, analysis, and recording of a human language. Also offered as Linguistics 407.
Mr. Davis

408b. Field Techniques and Analysis (3-0-3).
Continuation of Anthropology 407. Also offered as Linguistics 408.
Mr. Davis

414a. Hermeneutics and Linguistic Anthropology(3-0-3).
Application of linguistic theory and method in the analysis of cultural materials. Discourse analysis; the structure and interpretation of texts and conversation.
Mr. Tyler

458b. Human Osteology (3-0-3).
Introduction to the analysis of human skeletal material from archaeological sites.
Ms. McIntosh

490a. Directed Honors Research (3-0-3).
A two-semester sequence of independent research culminating in the preparation and defense of an honors thesis. Open only to candidates formally accepted into the honors program.

491b. Directed Honors Research (3-0-3).
See Anthropology 490.

506a. History of Anthropological Ideas (3-0-3).
Mr.Marcus

508a. History as a Cultural Myth (3-0-3).
Ms. Biesele

509a. Cultural Studies of Science
Ms. Traweek

513a. Language and Culture (3-0-3).
Mr. Tyler

514a. Orality, Literacy and Culture (3-0-3).
Mr. Maranhão

524b. Culture of Ancient Greece (3-0-3).
Mr. Maranhão

533b. Social and Cultural Theory (3-0-3).
Mr. Fischer

536b. The Art of Ethnography (3-0-3).
Mr. Marcus

540a. Camera and Culture
Ms. Traweek

545a. The Person Across Cultures (3-0-3).
Mr. Maranhão

548a. America as a Culture (3-0-3).
Mr. Fischer

553b. Cultures of India (3-0-3).
Mr. Tyler

556b. Ethnography of Tribal People (3-0-3).
Mr. Maranhão

562b. Archaeological Field Techniques (3-0-3).
Mr. McIntosh

565b. Cultural Ecology and the Ancient Landscape (3-0-3).
Mr. McIntosh

567a. Human Evolution (3-0-3).
Ms. McIntosh

568a. Primatology
Mr. Rasmussen

581a. Medical Anthropology (3-0-3).
Ms. Georges

583a. Human Adaptation (3-0-3).
Mr. Rasmussen

586b. Human Nutrition (3-0-3).
Ms. Georges

600a,b. Independent Study (Credit variable).

606b. Cognitive Anthropology (3-0-3).
Mr. Tyler

607a. Field Techniques and Analysis (3-0-3).
Mr. Davis

608b. Field Techniques and Analysis (3-0-3).
Mr. Davis

609a,b. Graduate Seminar (1-0-1).

614a. Hermaneutics and Linguistic Anthropology(3-0-3).

Mr. Tyler

658b. Human Osteology (3-0-3).

Ms. McIntosh

800a,b. Research and Thesis (Credit variable).

School of Architecture

Professor O. J. Mitchell, *Dean*
Professors Cannady, Casbarian, Papademetriou, and Todd
Visiting Professor Wilford
Associate Professors Parsons, Waldman, and Wittenberg
Assistant Professors Bavinger, Heile, Ingersoll, Pope, and Sherman
Visiting Associate Professor Samuels
Lecturers Blackburn, Colaco, Cunningham, Ford,
Mixon, Reiner, and White

Degrees Offered: B.A., B.Arch.,M.Arch., M.Arch. in Urban Design, D.Arch.

Preceptors

Cambridge Seven Associates
Cambridge, Massachusetts

Kliment and Halsband
New York, New York

Kohn, Pedersen & Fox Architects
New York, New York

Machado & Silvetti Assoc., Inc.
Boston, Massachusetts

Mitchell/Giurgola Associates
New York, New York

Morphosis
Los Angeles, CA

Murphy/Jahn
Chicago, Illinois

I.M. Pei & Partners
New York, New York

Cesar Pelli & Associates
New Haven, Connecticut

RTKL Associates
Dallas, Texas

RTKL Associates
Baltimore, Maryland

Rogers-Nagel-Langhart
Denver, Colorado

Harry Seidler Associates
Sydney, Australia

Skidmore Owings & Merrill
Chicago, Illinois

Robert A. Stern Architects
New York, New York

James Stirling — Michael Wilford & Assoc.
London, England

Taller De Arquitectura
Barcelona, Spain

Charles Tapley Associates
Houston, Texas

Venturi Rauch, Scott-Brown
Philadelphia, Pennsylvania

Architektengroep
Amsterdam, The Netherlands

Wallace, Roberts & Todd
Philadelphia, Pennsylvania

The School of Architecture seeks to contribute through teaching and research to a more humane environment. Its primary educational missions are teaching and research, development of a broad liberal education for undergraduates in the allied sciences and arts of architecture, and professional education at the graduate and postgraduate level in architecture and urban design.

These programs are offered in the setting of a small school to provide intimate student-faculty interaction, freedom for learning, and unrestricted institutional cooperation within and outside the University.

Degrees Offered. Five degrees are offered: Bachelor of Arts, Bachelor of Architecture, Master of Architecture, Master of Architecture in Urban Design, and Doctor of Architecture. The Bachelor of Arts, a liberal arts degree, may emphasize a major in either architecture or architectural studies; the two programs are described below. The B.A. is awarded after successful completion of the first four years of study. The Bachelor of Architecture is available to recipients of the B.A. degree from Rice and requires two additional years of work, one of which is an in-service preceptorship in a professional office.

The master's degrees are awarded after successful completion of a minimum of two years of study beyond the B.A., depending upon previous undergraduate and professional studies. Recipients of the B.A. degree from Rice normally undertake a minimum of three semesters of further work for one of the Master of Architecture degrees. Approval of Rice students for admission to either bachelor's or master's programs is contingent upon evaluation of the student's undergraduate academic record at the conclusion of the fourth year of study. The Master of Architecture is an accredited first professional degree, whereas the Master of Architecture in Urban Design requires prior or concurrent completion of accredited bachelor's or master's degrees.

Undergraduate Program. For both the B.A. and the B.Arch. degrees, the first two years center upon a carefully integrated study of the principles of architecture. In the third and fourth years, students are encouraged to develop their own interests through more specialized study of particular aspects of the field in studio, seminar, and lecture courses.

Below is a suggested course of study for either the B.A. or the B.Arch. degree. The order in which courses are taken is optional, subject to the following exceptions: (1) health and physical education must be taken in the first year, and (2) failure to take prerequisite courses in the earlier years may result in later scheduling problems.

Typical Curriculum

First semester (fall):
Architecture 101a —
Principles of Architecture I (studio);
History of Art 205a —
Introduction to the History of Art;
Physics 101a — Mechanics of Physics
or Physics 121a — Technical Physics
I; two other courses and physical
education.

Second semester (spring):
Architecture 102b —
Principles of Architecture I (studio);
History of Art 206b —
Introduction to the History of Art;
Architecture 132b — Changing Perspectives of Architecture;
Physics 102b —Electricity and
Magnetism or
Physics 122b — Technical Physics II;
two other courses and physical
education.

Third semester (fall):
Architecture 201a —
Principles of Architecture II (studio);
History of Art 345a — Renaissance
and Baroque Architecture;
Architecture 213a — Structural
and Constructional Systems I;
an elective in studio art;
one other course.

Fourth semester (spring):
Architecture 202b — Principles of Architecture II (studio);
History of Art 346b —
Modern Architecture;
Architecture 214b — Structural
and Constructional Systems II;
two other courses.

Fifth semester (fall):
Architecture 301a — Principles
of Architecture III (studio);
Architecture315a — Intermediate
Architectural Technology;
an elective in the social sciences;
an elective in studio art or visual
communications;
one other course.

Sixth semester (spring):
Architecture 302b — Selected
Architectural Problems I (studio);
Architecture 316b —Intermediate
Architectural Technology;
an elective in social science;
two other courses.

Seventh semester (fall):
Architecture 401a — Principles
of Architecture IV (studio);
an elective in environmental sciences;
three other courses.

Eighth semester (spring):
Architecture 402b — Selected
Architectural Problems II(studio);
an elective in environmental sciences;
three other courses.

The four-semester Bachelor of Architecture sequence complements the preprofessional undergraduate architecture major offered at Rice. It begins with a two-semester preceptorship (Architecture 500a,b — Preceptorship I and II) assigned to graduating seniors in the offices of leading practitioners in the United States and abroad. The preceptorship is followed by two semesters of studio and course work at the graduate level.

Typical Curriculum

First semester (fall):
Architecture 500a — Preceptorship I.

Second semester (spring):
Architecture 500b — Preceptorship II.

Third semester (fall):
Architecture 601a —
Architectural Problems (studio) or
Architecture 603a — Urban Design Workshop; or
Architecture 605a — Building Design Workshop;
two or three elective courses.

Fourth semester (spring):
Architecture 602b —
Architectural Problems (studio) or
Architecture 604b —
Urban Design Problems (studio) or
Architecture 608b — Design Thesis (studio)
two or three elective courses to satisfy minimum degree requirement of five electives.

Architecture 607a — Design Thesis (seminar) is a prerequisite for Architecture 608b. At least one urban design studio must be completed before graduation either as part of the preprofessional undergraduate major or as part of the Bachelor of Architecture program. Students must also take at least one elective course in urban design and two in building design. Architecture 605a — Building Design Workshop may be taken in lieu of the third semester studio.

The following information outlines the requirements for undergraduate degrees in the School of Architecture:

1. For a **Bachelor of Arts degree with a major in Architecture** the requirements are 95 semester hours credit chosen from architecture and nondepartmental listings in a manner satisfying School of Architecture distribution requirements *plus* 36 semester hours credit of electives for a *total* of 131 semester hours credit that complete University distribution requirements.
2. For a **Bachelor of Arts degree with a major in Architectural Studies** the requirements are 53 hours credit chosen from architecture and nondepartmental listings in a manner satisfying School of Architecture distribution requirements *plus* 78 semesterhours credit of electives for a *total* of 131 semester hours credit that complete university distribution requirements.
3. For a **Bachelor of Architecture degree** the requirements are: completion of a B.A. degree with a major in architecture (see 1 above); completion of a two-semester Preceptorship (30 semester hours credit); and completion of two studios and four lecture-seminar courses (32 semester hours credit).

B.A. students have two options in their choice of a preprofessional major during the third and fourth years:

1. The **architecture major** requires two years of advanced studio courses and additional professional group requirements that permit reasonable elective freedom. This curriculum serves the needs of students who anticipate professional studies at an advanced level and who wish to have the alternatives of doing so through either the Bachelor of Architecture at Rice or various first professionalmaster's degrees at Rice or other institutions.
2. The **architectural studies** major requires two years ofadvanced work combining architectural studies with other fields. It is focused on an approved, preprofessional theme for interdisciplinary studies chosen by the individual and approved by an adviser. Application to this program must be made during the second year of studies. Reduced architectural course requirements encourage the pursuit of a

double major with another department. This curriculum can be regarded as the equivalent of a liberal arts education, but it also offers opportunity to prepare for a wide variety of graduate studies and career options in different design and planning related fields at Rice or other institutions. This program provides opportunity to pursue architectural or urban design master's degree programs at Rice by entering through the Qualifying Graduate Program, but it does not include the option of a Rice Bachelor of Architecture.

Upon satisfactory completion of the B.A. degree with either above major, students may apply during the senior year for admission to the appropriate advanced professional degree programs.

Auxiliary services at Rice span the gap between school and practice: the preceptorship program, the visiting lecturer series, and the visiting critic series. The preceptorship program is designed to bridge classroom studio learning and professional practice. Qualified students who have been admitted to the professional degree programs work for an entire year with outstanding architects throughout the world who are designated by the school as preceptors. The timing of preceptorship service varies according to the level of design and technical proficiency reached during the B.A. program. For those admitted to the Bachelor of Architecture, the preceptorship occurs immediately on the receipt of the B.A.

Notes

1. History of Art 205, 206 are required in the first two years and will be scheduled where history of art electives are noted. History of Art 345, 346 are required for a major in architecture.
2. Electives must satisfy School of Architecture distribution requirements in addition to general University requirements.
3. Studio courses (Architecture 201, 202; 301, 302; and 401, 402) which carry six semester hours each semester in the sophomore, junior, and senior years count toward graduation as the equivalent of one course per semester in the sophomore year and as two courses per semester in the junior and senior years.
4. Students contemplating later specialization in the fields of structural or environmental engineering are advised to take Mathematics 101, 102 and Physics 101, 102 and 132.

Graduate Programs. The School of Architecture offers the degrees of Master of Architecture and Master of Architecture in Urban Design. Within the two degree programs, varied areas of interest areopen to students.

An advanced building design curriculum is the basis for the Master of Architecture degree program. This program is designed to provide the student an individual course of study with a wide choice of special project, research, and internship opportunitiesboth within and outside the School of Architecture.

The first year of the urban design curriculum is composed of studio and lecture courses. The second year allows a student choice and specialization in the areas of interest listed above.

Graduate studies are open to candidates who hold the degree of Bachelor of Architecture, Bachelor of Arts with a major in architecture, or Bachelor of Arts in other disciplines. Candidates with a Bachelor of Arts degree with a major in architecture are normally expected to complete four academic semestersplus one semester of clinical education, which may occur in the intervening summer. Students without sufficient architectural background are expected to complete a program of special studies before admission to one of the graduate options. This program takes a minimum of two semesters, depending on the individual's preparation, and stresses history, theory, technology, and design techniques.

Students not possessing a prior first professional degree and completing the urban design program requirements receive a Master of Architecture degree with a certificate in urban design.

For students having a bachelor's degree with no architectural background, the Qualifying Graduate Program is offered. This is normally a seven-semester program leading to the Master of Architecture degree. The first four semesters consist of special studio offerings plus selected seminar and lecture courses. The last three semesters are spent in the regular graduate programs.

An option for a master's thesis in lieu of part of the clinical education requirements is available for students who are oriented toward research and teaching in architecture or urban design.

Doctor of Architecture. Admission to the Doctor of Architecture program requires a master'sdegree in architecture. A student entering with a master's degree normally takes one and one-half years of course work before the qualifying examination. Candidates should be prepared for advanced analytic and creative work in their specialized field. Such preparation may include foreign languages, statistics, or a computer language. This requirement is established individually when the student is admitted.

After successful completion of all required course work plus the language examination or equivalent, students may apply for the qualifying examination. At this time, students must submit an outline of their research program for the doctoral dissertation. This dissertation must represent an original contribution to knowledge in the field of architecture. The completion of the dissertation and the passing of the final oral examination required for the doctorate in architecture take a minimum of one year.

Architecture Courses

101a. Principles of Architecture I (2-6-4).
Visual studies of restricted dimensions, explorations using simple tools and materials to develop an awareness of the environment. Requisite for architecture majors. Limited enrollment.
Mr. Ingersoll

102b. Principles of Architecture I (2-6-4).
A development of communication of formal information from further investigation of visual structures and their order. Requisite for architecture majors. By permission of instructor only.
Mr. Todd

132b. Changing Perspectives of Architecture (2-0-2).
Introductory tutorial. Reading, field trips, and observation of current events and public affairs to understand the values, institutions, and nature of environmental changes relating to future role and practice of architecture.
Mr. Mitchell

201a. Principles of Architecture II (3-9-6).
Introduction to concepts of beginning architectural design. Manipulation of visual structure to render formal and operational information. Design process as problem solving with emphasis on conscious method. Requisite for architecture majors.
Mr. Casbarian, Ms. Glitsch

202b. Principles of Architecture II (3-9-6).
See Architecture 201.
Mr. Casbarian, Ms. Glitsch

213a. Structural and Construction Systems I (3-0-3).
Introduction to characteristics of structural and construction systems in architectural technology. Lab experiments are combined with lectures on systems, methods and their historical development.
Mr. Wittenberg

214b. Structural and Construction Systems IIi (3-0-3).
Application of materials and construction (wood, masonry, concrete, and steel). Case studies and field trips.

Mr. Cunningham

301a. Principles of Architecture III (2-12-6).
Intermediate level design problems with emphasis on building technology, programming and formal design. Requisite for preprofessional major in architecture. Prerequisites: Architecture 201 and 202.

Mr. Wittenberg

302b. Selected Architectural Problems I (2-12-6).
Variety of intermediate level problems for developing comprehensive experience in design methods and processes. Requisite for preprofessional major in architecture. Prerequisites: Architecture 201, 202, and 301.

Mr. Parsons, Mr. Sherman, Mr. Samuels

315a. Structural and Constructional Systems III(3-0-3).
Application of principles of analysis to construction of steel and concrete framed structures. Continuation of Architecture 213, 214.

Mr. Cunningham

316b. Building Climatology (3-0-3).
An introduction to the thermal performance of buildings. Course is divided into two parts: building climatology and air conditioning systems.

Mr. Wittenberg

336b. Introduction to Urban Issues (3-0-3).
Major issues and problems confronting metropolitan centers; emphasis on physical and built environment. Visiting lecturers on transportation, housing, education, minority problems, new communities, physical development and redevelopment. Course is open to all students.

Mr. Reiner

341a. Introduction to Urban Design (3-0-3).
Introduction to the field of urban design emphasizing history, theory, and practice. Comparative analyses consider the management of urban growth and change. Open to students outside of architecture.

Mr. Mitchell

343a. The History of the City (3-0-3).
Historical survey of the city from Sumer to the Baroque capitals.

Mr. Ingersoll

344b. Construction and Design (3-0-3).
A seminar in which the relationship between the construction of an object and its usefulness is explored. The premise in the course is that the way things are made can be one credible point of departure for the architectural design process.

Mr. Parsons

345a. Natural Environment Factors (3-0-3).
An overview of issues on natural resource consumption and environmental impact pertinent to urban design activities. Also offered as Environment 445.

Mr. Blackburn

353a. Photography for Architects (3-0-3).
Exploration of a variety of photographic techniques for architectural research, design, and presentation. Enrollment limited.

Mr. White

401a. Principles of Architecture IV (12-2-6).
Upper level architectural design problems with an emphasis on program definition in a social context, site planning and building organization. Required for preprofessional major in architecture. Prerequisites: Architecture 301, 302.

Mr. Sherman & Visiting Critic

402b. Selected Architectural Problems II (2-12-6).
See Architecture 302.

Mr. Parsons, Mr. Sherman, Mr. Samuels

410b. Building Climatology (3-0-3).
Lectures and individual student research dealing with issues governing human comfort in buildings. Emphasis is placed on modifying climate through architectural measures that exploit the use of natural phenomena. Course requirements include wind tunnel experiments and term papers.

Mr. Parsons

412b. Advanced Design of Structural Systems (3-0-3).
Advanced course in structural design. Topics include factors controlling structural design of buildings, floor systems, building systems, facade treatments, long span structures, pneumatic and cable structures, and new structural systems and materials. Case studies will also be conducted. Prerequisites: Architecture 213, 214, 315, or equivalent.

Mr. Colaco, Mr. Ford

415a. Architectural Theory and Criticism (3-0-3).
Seminar dealing with landmark texts in architectural theory and criticism.

Mr. Sherman

418b. Fundamental Issues in Modernism (3-0-3).
Examine fundamental issues of modernism in architecture emerging from both European and American sources. Systematic analysis of the works and writings of major twentieth-century architects.

Mr. Ingersoll

419a. Advanced Topics in Environmental Control(3-0-3).
Advanced study in one or more topics in environmental control, including building climatology, energy conservation, lighting, and acoustics. Prerequisite: Architecture 316.

Mr. Wittenberg

420b. History of Building Technology (3-0-3).
Survey of the history of building technology from ancient times to the present. Lectures cover theory, methods and practical applications.

Mr. Wittenberg

422a,b. Computer Graphics in Architecture (3-0-3).
Introduction to theory and practice of computer graphics applications in architecture including instruction in both conceptual aspects and programming techniques.

Mr. Heile

424b. Computer Aided Design (3-0-3).
Advanced computer graphic techniques using CAD in architecture as a design & presentation medium.

Mr. Heile

427a. Dualities in Architecture (3-0-3).
A course in design theory built around the theme of recurrent dualities in form and function. Course material covers the composition of building forms and culminates with an examination of the urban fabric.

Mr. Waldman

437a. Computer Applications (3-0-3).
Individual projects in the application of computer technology to architectural programing, planning, and urban design, graphic display, and problem analysis.

Mr. Bavinger

438b. Computer-Aided Architectural Design (3-0-3).
Theory and practice of computer-aided design for application to architecture, urban design and planning, including instruction in special programming techniques, graphic display and data base management. Prerequisite: Architecture 437, 637, or permission of instructor.

Mr. Bavinger

440b. Housing Typologies (3-0-3).
Exploration of the development and elaboration of housing types at the building and urban scale. Course offered every other year.

Mr. Waldman

451b. Architectural Measured Drawing (3-0-3).
Analysis of historic and contemporary examples of architecture or civil engineering through measured drawings constructed to standards. Drawings become part of a permanent architectural archive. Limited enrollment. Prerequisite: Permission of instructor.

Mr. Papademetriou

461a,b. Special Projects (Credit variable).
Independent research or design arranged in consultation with a faculty member. Subject to approval of faculty adviser and director. Very limited enrollment.

Mr. Wittenberg

500a,b. Preceptorship Program (0-0-15).
Requisite for admission to graduate studies in architecture for all recipients of Rice B.A. degrees in preprofessional or area majors. Student completes 9 to 12 months of full-time internship under guidance of an appointed preceptor.

Mr. Casbarian

501a. Qualifying Graduate Workshop I (10-15-13).
Requisite for admission to graduate professional program options in architecture or urban design for students with nonarchitectural bachelor's degree. Lectures, seminars, laboratories, and design studio projects adjusted to individual needs. Prerequisites determined by the Graduate Graduate Affairs Committee with the School of Architecture.

Mr. Todd

502b. Qualifying Graduate Workshop II (5-15-10).
See Architecture 501.

Mr. Wittenberg

503a. Graduate Workshop III (5-15-10).
Design studio to follow Architecture 501, 502. Preparation for entering studios in the regular graduate programs in architecture and urban design in the following semester.

Mr. Parsons

504b. Graduate Workshop IV (5-15-10).
See Archtecture 503.

Mr. Pope

514b. Building Technology and Structures I (3-0-3).
A course in structures for students in the Qualifying Graduate Program. Topics include: structure in architecture; forces and equilibrium; structural materials; the behavior, analysis, and design of structural elements and their connections.

Mr. Cunningham

515a. Building Technology and Structures II (3-0-3).
A second course in structures for students in the Qualifying Graduate Program. Additional topics in the behavior, analysis, and design of structural elements; synthesis of structural elements into structural systems; integration of structural systems with other building systems. Prerequisite: Architecture 514.

Mr. Cunningham

516b. Building Climatology (3-0-3).
See Architecture 316.

Mr. Wittenberg

541a. Recent Trends in Architecture (3-0-3)
A survey of the development, reappraisal & transformation of architectural ideals in the period since 1945.

Mr. Pope

544b. Construction and Design (3-0-3).
See Architecture 344.

Mr. Parsons

600a,b. Qualifying Graduate Practical Internship(Credit variable).
Practical work experience for students who have completed at least four semesters in the Qualifying Graduate Program prior to their entrance into the regular Master of Architecture studio sequence. Permission of instructor required. Very limited enrollment.

Mr. Todd

601a. Architectural Problems: Studio (5-15-10).
Emphasis on abstract thought and design capabilities relevant to systematic processes of designing specific buildings and facilities. Prerequisite: Architecture 500 or 501-504.

Mr. Cannady

602b. Architectural Problems (5-15-10).
Emphasis on abstract thought and design capabilities relevant to systematic processes of designing specific buildings and facilities. Prerequisite: Architecture 500 or 501-504.

Mr. Papademetriou

603a. Urban Design Workshop I (5-15-10).
Introductory studio in urban design with an emphasis on exploration of social and environmental forces shaping urban form, as well as the representation of urban design ideas. The workshop is conducted as a sequence of analytical and design exercises. Requisite for M. Arch. Urban Design degree. Prerequisite: Architecture 501-504.

604b. Urban Design Workshop II (5-15-10).
Developing abstract thought, applied design and planning capabilities to total urban systems, large-scale developments, or other broad environmental action. Requisite for M. Arch. Urban Design degree. Prerequisite: Architecture 603.

606a,b. Thesis (5-15-10).
Independent investigations in architecture or urban design, culminating in preparation and presentation of a master's thesis.

Mr. Cannady

607a. Design Thesis: Seminar (3-0-3).
An applied problem-solving laboratory, preparatory to Architecture 608, in which program development, site analysis, and conceptual design studios are pursued. Prerequisite: Architecture 603.

Mr. Ingersoll

608b. Design Thesis: Studio (5-15-10).
A design studio, following Architecture 607, where a building program is carried from predesign analysis, through design, to design development.
Prerequisites: Architecture 501-504, 607.

Mr. Cannady

1609b. Architecture for Nonarchitects (3-0-3).
classroom teaching under the supervision of the instructor. For elective credit only.

Mr. Casbarian

612b. Advanced Design of Structural Systems (3-0-3).
See Architecture 414.

Mr. Colaco, Mr. Ford

615a. Architectural Theory and Criticism (3-0-3).
Seminar dealing with landmark texts in architectural theory and criticism. Prerequisite: permission of instructor.

Mr. Sherman

618b. Fundamental Issues in Modernism (3-0-3).
Same as Architecture 418.

Mr. Ingersoll

619a. Advanced Topics in Environmental Control(3-0-3).
See Arch 419.

Mr. Wittenberg

620b. History of Building Technology (3-0-3).
Same as Architecture 420.

Mr. Wittenberg

621a. Introduction to Urban Design (3-0-3).
Comparative analysis of recent theory and practice in projecting and controlling urban growth and change. See Architecture 341.

Mr. Mitchell

622a,b. Computer Graphics in Architecture (3-0-3).
Advanced theory and practice of computer graphics applications in architecture including instruction in both conceptual aspects and programming techniques.

Mr. Heile

627a. Dualities in Architecture (3-0-3).
See Architecture 427.

Mr. Waldman

635a,b. Computer Projects in Architecture and Urban Development (3-0-3).
Special projects for advanced students in computer applications. Prerequisite: permission of instructor.

Mr. Bavinger

636b. Introduction to Urban Issues (3-0-3).
See Architecture 635a.

Mr. Reiner

637a. Computer Applications (3-0-3).
See Architecture 437.

Mr. Bavinger

638b. Computer-Aided Architectural Design (3-0-3).
See Architecture 438.

Mr. Bavinger

640b. Housing Typologies (3-0-3).
See Architecture 440.

Mr. Waldman

643a. The History of the City
See Architecture 343.

Mr. Ingersoll

645a. Natural Environmental Factors (3-0-3).
See Architecture 345.

Mr. Blackburn

652a. Planning Law (3-0-3).
Legal and economic considerations in practical land and building development; public controls, private/public sector relationships, entrepreneurial objectives, financing methods. Case studies in total development "packaging."

Mr. Mixon

665a. Graduate Seminar in Architectural Design (3-0-3).
Seminars structured around topics dealing with design theory, with special emphasis on participation by visiting critics and professors.

Visiting Critic

666b. Grad Seminar in Architectural Design (3-0-3).
Same as Architecture 665.

Visiting Critic

700a,b. Practicum (Credit variable).
Full-time internship service in approved local offices under interdisciplinary supervision. Emphasis on "real world" design, planning, or research experiences. Special tuition. May be taken in any semester or in summer.

Mr. Cannady

705a,b. Thesis Seminar (3-0-3).
Seminar for students enrolled in Architecture 606.

Mr. Ingersoll

711a,b. Special Projects (Credit variable).
Independent research or design arranged in consultation with a faculty member subject to approval of the student's faculty adviser and director.

Mr. Cannady

714a,b. Independent Design Projects (Credit variable).

Mr. Cannady

800a,b. Graduate Research (Credit variable).

Mr. Cannady

Art and Art History

Professor K.T. Brown, *Chair*
Professors, Camfield, Havens, Poulos and Winningham
Associate Professors Boterf, Broker, Huberman,
G. Smith *(on leave spring 1988),* **and Widrig**
Assistant Professors Barnes, *(on leave spring 1988),* **P.T. Brown, Grayson,**
Ulrich *(on leave spring 1988),* **and Wilson**
Visiting Professors Oliver-Smith and O'Neil
Visiting Lecturers Davezac, Dunn, Lukitsh, and McEvilley

Degrees Offered: B.A., B.F.A., M.A.

The Department of Art and Art History offers courses in three distinct disciplines: the history of art, studio art (painting, drawing, sculpture, etc.), and film and photography. Majors may elect to concentrate their study in any of these areas of specialization.

UndergraduateProgram. A minimum of 38 semester hours is required for the full major, including at least 11 semester hours in the history of art and nine semester hours selected from studio, film, or photography. Double majors must take a minimum of 32 semester hours, including at least three courses in both the creative arts and the history of art. All majors must complete the two semesters of the introductory survey, History of Art 205 and 206. For all majors at least 50 percent of the required number of courses must be at the 300- or 400-level, of which more than 50 percent must be taken at Rice.

In addition to the departmental requirements for the major, students must also satisfy all the University requirements for the B.A. degree. See Degree Requirements and Majors, pages 54-68.

A reading knowledge of French, German, or Italian is strongly recommended for all majors, especially those who intend to take 300- or 400-level courses in the history of art.

Students interested in further guidance in planning the Bachelor of Arts degree with a major in art and art history should consult departmental faculty advisers.

Bachelor of Fine Arts Program. The Bachelor of Fine Arts program consists of a fifth year of intensive study in the creative arts to be taken after a student has obtained a B.A. degree in art at Rice or its equivalent at another university. Candidates possessing a B.A. degree with a major in a field other than art may in exceptional cases be admitted to the program. Special fifth-year courses are available to the B.F.A. candidate only, in addition to advanced courses normally offered by the department. Satisfactory completion of a total of 30 semester hours in approved courses or the equivalent in approved major electives at the 300-, 400-, or 500-level is required for the B.F.A. degree.

Admission to the program is determined by the Committee on Examinations and Standing on recommendation of the Bachelor of Fine Arts Committee in the Department. For further information about application forms, deadlines, admission standards, and the like, write to the chairman of the Department of Art and Art History.

Graduate Program. Qualified students are eligible to apply for the graduate program leading to a degree of Master of Arts in art history with an option in classical archaeology. Areas of concentration in art history are those in the western tradition of European and American Art. Graduate work is also possible in Asian Studies.

Graduate fellowships and scholarships are awarded on the basis of scholarly achievement and available funds. Fellowships consist of a stipend and a waiver of tuition; scholarships provide only a waiver of tuition. Graduate students as part of their training may be expected to render some service as research assistants, tutorial instructors, or curatorial assistants in the Sewall Art Gallery.

Entering students must pass a reading examination in either French or German. In classical archaeology, students must pass a reading examination in one of the following languages: French, German, Italian, Greek, or Latin. Other languages may be required depending on the course of studies chosen by the student. Upon entrance, students may be required to take an examination to be used as a guide in determining their programs.

Requirements for the Degree of Master of Arts:

1. Complete with high standing a minimum of 30 hours of graduate course work to include a 3-hour course in art historical concepts, history, and methods of research; a 9-hour thesis in the second year; and 18 hours of lecture, seminar, and reading courses. For students in classical archaeology, 6 hours must be in archaeological field experience applied to specific research in addition to the above requirements.
2. Pass satisfactorily a comprehensive examination in the second year.

Sewall Art Gallery

Marion Grayson, *Director*

Sewall Art Gallery, located on the main floor of Sewall Hall, functions principally as an extension of the teaching activities in the Department of Art and Art History. The

gallery actively collects art works which are used for instruction, research, loan, and exhibitions. Four to six exhibitions are mounted during the academic year, focusing on historical and contemporary presentations of painting, sculpture, and graphic, video, and performance arts. The gallery is staffed by a professional coordinator and students, who gain experience in museum registration methods, exhibition techniques, and other aspects of museum work. Junior, senior, or graduate students interested in museum experience may also apply for the Museum Internship, offered in cooperation with local museums (see History of Art 496).

History of Art and Architecture

History of Art Courses

205a. Introduction to the History of Art (4-0-4).
A survey of painting, sculpture, and architecture from the Paleolithic period to the fourteenth century. Enrollment limited to 125. An additional hour of tutorial per week will be assigned during the first week.

Mr. Widrig

206b. Introduction to the History of Art (4-0-4).
A survey of painting, sculpture, and architecture from the Renaissance to the twentieth century. History of Art 205 strongly recommended.

Mr. Camfield

209b. Introduction to Asian Art (3-0-3).
A survey of the art of Asia from the Neolithic period to the present.

Mr. Wilson

218b. History of Film (3-0-3).
Classic films from both silent and sound eras. Griffith, Eisenstein, Chaplin, Stroheim, Sternberg, Renoir, Renais, Godard, Bergman, and others. Attention to technique, theory, principles of criticism, relationship to art history in general. Students who have already taken History of Art 215 or 216 not eligible for credit.

Mr. McEvilley

220a. History of Photography (3-0-3).
A topical introductory survey of the history of photography from its pre-history through the 1980s.

Ms. Lukitsh

291a. Special Topics (3-0-3).
Courses at the introductory level or special research and reading. May be used in awarding transfer credit. Prerequisite: permission of instructor.

292b. Special Topics (3-0-3).

293a. Special Topics (3-0-3).

294b. Special Topics (3-0-3).

295a. Special Topics (3-0-3).

296b. Special Topics (3-0-3).

308b. Roman Art and Archaeology (3-0-3)
The painting, sculpture, and architecture of ancient Rome from roots in Etruscan art through the Republican and Imperial eras to the age of Constantine.

Mr. Oliver-Smith

309b. Late Antique and Early Christian Art (3-0-3)
The adaptation of Late Antique art and architecture to Christian content in the centuries following Constantine.

Mr. Widrig

321b. Art and the Mind (3-0-3).
Selected topics in art history, criticism, esthetics, philosophy and the psychology of art. Previous art history courses desirable but not required.

Mr. McEvilley

345a. Renaissance and Baroque Architecture (3-0-3).
Renaissance architecture considered as a conscious break with medieval practice; its stylistic and theoretical development, primarily in Italy, during the fifteenth, sixteenth, and seventeenth centuries.

Mr. Widrig

346b. Nineteenth and Twentieth Century Architectural History (3-0-3).
The origins of modern architecture in rival modes of the eighteenth and nineteenth centuries; the new architecture of Richardson, Sullivan, and Wright; the International Style of Gropius, Le Corbusier, and Mies to the mid-twentieth century.

Mr. Widrig

350b. Nineteenth Century Photography (3-0-3)
Investigation of the development and applications of photography after 1855, the period of photography's "industrialization." Emphasis on photography's impact upon the fine arts.

Ms. Lukitsh

361a. Chinese Art and Archaeology (3-0-3).
Chinese painting, sculpture, and decorative arts with special consideration of recent archaeological finds. Prerequisite: History of Art 209 or permission of instructor.

Mr. Wilson

365a. Arts of Japan (3-0-3).
From pre-Buddhist Japanese art to the impact of Chinese and Korean culture and emergence of indigenous Japanese expression in art and architecture. Prerequisite: History of Art 209 or permission of the instructor.

Mr. Wilson

417a. Baroque Art (3-0-3)
Exploration of new spaces and expressive possibilities in seventeenth-and eighteenth-century art with particular attention to the achievement of major artists and architects.

Ms. Brown

418b. Baroque and Rococo Art (3-0-3)
See History of Art 417.

Ms. Brown

461b. Nineteenth-Century Art (3-0-3)
Major developments in painting and sculpture from late eighteenth-century Neoclassicism and Romanticism through Realism and Impressionism.

Staff

463b. Trends in Art Since 1940 (3-0-3)
Consideration of trends in the painting and sculpture of American and Europe from Abstract Expressionism to the present. Emphasis on American Art and criticism. Prerequisite: History of Art 475 or permission of instructor.

Mr. Camfield

475a. European Twentieth-Century Art (3-0-3)
Consideration of major developments in painting and sculpture from the 1880s to the 1940s: Impressionism and Post-Impressionism through Expressionism, Cubism, Abstractions, Dada, and Surrealism. Brief consideration of architecture and photography.
Mr. Camfield

480b. Approaches to Art History (3-0-3).
Survey of important approaches to the study of art from antiquity to the present; theories of art; biographies of artists; connoisseurship; art history as a discipline beginning with Winckelmann.
Mr. Davezac

483a. Archaeological Field Work and Research (3-0-3).
Field work and research applied to specific archaeological problems.
Mr. Widrig

484b. Archaeological Field Work and Research (3-0-3).
See History of Art 483.
Mr. Widrig

492b. Decorative Arts of Asia (3-0-3).
Prerequisite: permission of instructor.
Mr. Wilson

495a. Museum Intern Program (Credit variable).
Prerequisite: permission of instructor.
Ms. Grayson

496b. Museum Internship (Credit variable).
See History of Art 495.
Ms. Grayson

497a. Senior Thesis (1-0-1).
Thesis written under the direction of a member of the faculty. Limited to senior art majors. Prerequisite: permission of faculty.

498b. Senior Thesis (1-0-1).
See History of Art 497.

499b. Art and Literature (3-0-3)
Also offered as English 402. Recommended elective; not accepted in fulfillment of the major requirements in Art and Art History
Mr. Snow

500b. Approaches to Art History (3-0-3).
Graduate level. See History of Art 480.
Mr. Davezac

575a. Topics in Modern Art (Credit variable).

583a. Archaeological Field Work and Research (3-0-3).
Graduate level. See History of Art 483,484.
Mr. Widrig

584b. Archaeological Field Work and Research (3-0-3).
See History of Art 483.
Mr. Widrig

585a. Independent Reading (3-0-3).
Mr. Camfield

586b. Independent Reading (3-0-3).

591a. Master of Arts Thesis (Credit variable).
Graduate level courses or special research and reading. Prerequisite: permission of instructor.
Mr. Camfield

592a,b. Master of Arts Thesis (Credit variable).

593a. Special Topics (3-0-3).

594a,b. Special Topics (3-0-3).

595a. Special Topics (3-0-3).

596a,b. Special Topics (3-0-3).
See History of Art 591.

597a. Museum Intern Program (Credit variable).
See History of Art 495. Prerequisite: permission of instructor.
Ms. Grayson

598b. Museum Internship (Credit variable).
See History of Art 496. Prerequisite: permission of instructor.
Ms. Grayson

800a,b,c. Thesis and Research (Credit variable).

Studio Art, Film and Photography

Arts Courses

101a. Design I (0-6-3).
Principles of two and three-dimensional design problems exploring individual creative solutions, various media. Architecture 101 accepted as equivalent.
Mr. Smith

205a. Photography I (0-6-3).
Exploration of the basic materials and processes of the photographic medium; viewing, analysis, and discussion of the medium's history and current trends.
Mr. Winningham, Mr. Brown

206b. Photography I (0-6-3).
See Arts 205.
Mr. Brown

216b. 35mm Photography (0-6-3).
An introductory course in black and white 35mm photography. Exploration of the materials and process involved in the exposure, development, and printing of 35mm negatives. Class critiques, analysis, and discussion of photographic history. Viewing and discussion of contemporary work.
Mr. Brown

225a,b. Drawing I (0-6-3).
Introduction to the problems of drawing using various media (pencil, charcoal, pen-and-ink, pastel).
Mr. Boterf, Mr. O'Neil, Mr. Poulos, Mr. Smith, Staff

227b. Color Drawing (0-6-3).
Introduction to color using still lifes and employing various media (pastel and watercolor). Prerequisite: permission of the instructor.
Mr. Poulos

291a. Special Problems in Design (Variable).
Problems at the introductory level in creative art with individual instruction and criticism. May be used in awarding transfer credit.

292b. Special Problems in Drawing (Variable).

293a. Special Problems in Drawing (Variable).

294b. Special Problems in Studio Art (Variable).

295a. Special Problems in Photography (Variable).

296b. Special Problems in Film and Videotape Making(Variable).
See Arts 291.
Mr. Huberman

305a. Photography II (3-3-3).
Advanced problems in photography. Emphasis on independent pursuit of projects submitted by the students.
Mr. Brown

306b. Photography II (3-3-3).
See Arts 305.
Mr. Winningham, Mr. Brown

311a,b. Etching I (3-3-3).
Etching in black and white, color, and monoprint techniques.
Ms. Broker

313a. Lithography I (0-6-3).
Stone lithography in black and white.
Ms. Broker

325a. Life Drawing (0-6-3).
Drawing from the model in various media. Prerequisite: Permission of instructor.
Mr. Boterf

326b. Life Drawing (0-6-3).
See Arts 325.
Staff

327a,b. Film and Videotape Making I (0-5-3).
A study of the expressive possibilities of the media. Synchronous sound, using super-eight millimeter film, plus video tape.
Mr. Huberman

328a,b. Film and Videotape Making Tape Making I(0-5-3).
One major film project by the class employing 16mm film and synchronous sound equipment.
Mr. Huberman

329a. Film Form (3-0-3).
Viewing, analysis, and discussion of modern and classic films.
Mr. Huberman

345a. Color Photography (3-0-3).
Fundamental techniques of color photography, including special problems in color camera work, color negative and transparency processing, and color printing. Prerequisite: Arts 205, 206.
Mr. Winningham, Mr. Brown

346b. Color Photography (3-0-3).
See Arts 345.
Mr. Winningham, Mr. Brown

365a. Sculpture I (0-6-3).
Sculpture in wood, metal welding, and other sculptural media.
Mr. Smith

391b. Special Problems in Drawing (Variable).
Problems in creative art with individual instruction and criticism. May be used in awarding transfer credit. Prerequisite: permission of instructor.

392a,b. Special Problems in Life Drawing (Variable).

393a,b. Special Problems in Painting (Variable).

394a,b. Special Problems in Printmaking (Variable).
Ms. Broker

395a,b. Special Problems in Photography (Variable).
Mr. Brown

396a,b. Special Problems in Film And Videotape(Variable).
See Arts 391.
Mr. Huberman

397a. Special Problems in Sculpture (Variable).
Mr. Smith

423a. Painting on Paper (0-6-3).
Oil paint, oil stick, collage, and various contemporary mixed media may be employed. Enrollment limited to 15. Prerequisite: Drawing I or Arts 101.
Mr. Boterf

424b. Water Color (0-6-3).
Both transparent and opaque watercolor media used in a variety of methods. Enrollment limited to 15. Prerequisite: Drawing I and permission of instructor.
Mr. O'Neil

427a. Film and Videotape Making II (1-5-3).
One major film project by each student, using either video or 16mm film.
Mr. Huberman

428b. Film and Videotape Making II (1-5-3).
See Arts 427.
Mr. Huberman

432b. Film Genre: The Western (3-0-3).
The essential American film experience spanning all the years of U.S. cinema. Focusing on the Western, the course concerns itself with the mythic function of this film genre.
Mr. Huberman

445a,b. Special Problems in Drawing (Variable).
Advanced problems in creative art with individual instruction and criticism. May be used in awarding transfer credit. Prerequisite: permission of instructor.

446a,b. Special Problems in Drawing (Variable).

447a,b. Special Problems in Life Drawing (Variable).

448a,b. Special Problems in Life Drawing (Variable).

449b,a. Special Problems in Printmaking (Variable).

450a,b. Special Problems in Printmaking (Variable).

451a,b. Special Problems in Painting (Variable).

452a,b. Special Problems in Painting (Variable).

453a,b. Special Problems in Photography (Variable).

Mr. Brown

454b,a. Special Problems in Photography (Variable).

455a,b. Special Problems in Film and Videotape(Variable).

Mr. Huberman

456a,b. Special Problems in Film and Videotape(Variable).
See Arts 445.

Mr. Huberman

457a. Special Problems in Sculpture (Variable).

458a,b. Special Problems in Sculpture (Variable).

475a. Painting II (0-6-3).
Advanced problems in painting. Emphasis on independent development and participation in class critiques. Prerequisite: Painting I and permission of instructor.

Mr. Poulos

476b. Painting II (3-0-3).
See Arts 475.

Mr. Poulos

501a. Studio I: Painting (0-6-3).
Individual work in the studio arts, film, or photography under the direction of one or more staff members. Restricted to B.F.A. degree candidates.

502b. Studio I: Painting (0-6-3).
See Arts 501.

503a. Studio I: Sculpture (0-6-3).
See Arts 501.

Mr. Smith

504b. Studio I: Sculpture (0-6-3).
See Arts 501.

505a. Studio I: Drawing (0-6-3).
See Arts 501.

506b. Studio I: Drawing (0-6-3).
See Arts 501.

507a. Studio I: Life Drawing (0-6-3).
See Arts 501.

508b. Studio I: Life Drawing (0-6-3).
See Arts 501.

509a. Studio I: Design (0-6-3).
See Arts 501.

510b. Studio I: Design (0-6-3).
See Arts 501.

511a. Studio I: Printmaking (0-6-3).
See Arts 501.

512b. Studio I: Printmaking (0-6-3).
See Arts 501.

513a. Studio I: Photography (0-6-3).
See Arts 501.

Mr. Winningham

514b. Studio I: Photography (0-6-3).
See Arts 501.

515a. Studio I: Filmmaking (0-6-3).
See Arts 501.

516b. Studio I: Filmmaking (0-6-3).
See Arts 501.

520a. Studio II: Painting (0-12-6).
The same as Arts 501-516 with increased credit hours.

521b. Studio II: Painting (0-12-6).
See Arts 520.

522a. Studio II: Sculpture (0-12-6).
See Arts 520.

523b. Studio II: Sculpture (0-12-6).
See Arts 520.

524a. Studio II: Drawing (0-12-6).
See Arts 520.

525b. Studio II: Drawing (0-12-6).
See Arts 520.

526a. Studio II: Life Drawing (0-12-6).
See Arts 520.

527b. Studio II: Life Drawing (0-12-6).
See Arts 520.

528a. Studio II: Design (0-12-6).
See Arts 520.

529b. Studio II: Design (0-12-6).
See Arts 520.

530a. Studio II: Printmaking (0-12-6).
See Arts 520.

Ms. Broker

531b. Studio II: Printmaking (0-12-6).
See Arts 520.

532a. Studio II: Photography (0-12-6).
See Arts 520.

533b. Studio II: Photography (0-12-6).
See Arts 520.

534a. Studio II: Filmmaking (0-12-6).
See Arts 533.

535b. Studio III: Filmmaking (0-12-6).
See Arts 520.

540a. Studio III: Painting (0-18-9).
Same as Arts 501-516 with increased credit hours.

542a. Studio III: Sculpture (0-18-9).
See Arts 540.

544a. Studio III: Printmaking (0-18-9).
See Arts 540.

546a. Studio III: Photography (0-18-9).
See Arts 540.

Mr. Winningham

547b. Studio III: Photography (0-18-9).
See Arts 540.

548a. Studio III: Filmmaking (0-18-9).
See Arts 540.

Mr. Huberman

549b. Studio III: Filmmaking (0-18-9).
See Arts 540.

Theater Courses

227a,b. Special Problems (3-0-3).
Topics in theater production, history, or literature tailored to the individual student. Prerequisite: permission of instructor.

Mr. Havens

228a,b. Special Problems (3-0-3).

Mr. Havens

229a,b. Special Problems (3-0-3).
See Theater 227.

Mr. Havens

301a. Acting I (3-0-3).
Development of the actor's technique through exercises in body work, concentration, creative imagination, sensory perception, and improvisation. Prerequisite: Permission of instructor.

Mr. Havens

302b. Acting II (3-0-3).
Script analysis, characterization, work on acting roles. Prerequisite: Permission of instructor.
Mr. Havens

430a,b. Special Problems (3-0-3).
Advanced topics in theater production, history, or literature. Prerequisite: Permission of instructor.
Mr. Havens

431a,b. Special Problems (3-0-3).
Mr. Havens

432a,b. Special Problems (3-0-3).
See Theater 430.
Mr. Havens, Ms. Chadwick

Biochemistry

Professor K.S. Matthews, *Chair*
Professors Olson, Palmer, Rudolph, Schroepfer, and J.B. Walker
Associate Professors Beckingham, Bennett, and G. N. Phillips
Instructor Cooper

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduate biochemistry majors must complete the following courses:

First-year level: Mathematics 101, 102 or 121, 122; Chemistry 101, 102, 107; Physics 101, 102; Physics 132.

Second-year level: Mathematics 211, 212; Chemistry 211, 212, 213, 214; and any advanced physics or mathematics course or Mathematical Sciences 223 or other approved computer course.

Advanced level: Biochemistry 361, 362, and 367; Chemistry 311, 312; at least 6 semester hours of advanced level biochemistry (Biochemistry 461, 462, 471, 472, and/or 466); an additional three semester hours of advanced chemistry, biology, or biochemistry (300-level or above). For double majors, part of the requirement for six hours of advanced biochemistry may be satisfied by 300-level or above science courses in their other major. However, waiver of this requirement must be obtained in writing from the undergraduate adviser and the Chair of the Biochemistry Department.

An undergraduate major in biochemistry must have 48 semester hours in courses numbered 300 or higher to obtain a Bachelor of Arts degree.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 129 semester hours. See Degree Requirements and Majors, pages 54-68.

Undergraduate majors in biochemistry are encouraged but not required to pursue independent supervised research in Biochemistry 401 and 402. Concurrent registration in Biochemistry 411 and a thesis are required.

Graduate Program. Admission to graduate study in the Department requires: (1) a bachelor's degree in biochemistry, biology, chemistry, physics, or the equivalent; and (2) demonstrated quality and motivation as indicated by the student's previous academic record, Graduate Record Examination scores and recommendation letters. Although the Department offers an M.A. degree in biochemistry, only on rare occasions will a student who does not intend to pursue the Ph.D. degree be admitted to the graduate program. Both degree programs require the submission of a thesis based on original research work. The advanced degree requirements outlined below are those established by the Department of Biochemistry and are above and beyond the general requirements of Rice University for the M.A. and Ph.D. degrees. The student should be familiar with the general University regulations and policies for graduate students (listed on pages 111-113). For further information, interested applicants should contact the Department Chair.

A. Doctor of Philosophy Degree Program in Biochemistry. Most of the formal course studies will be completed in the first year of residence so that the student will commence thesis research at the end of the second semester of residence. The course program to be pursued during the first year of residence will be determined by the biochemistry graduate student advisory committee in consultation with each student. All students are expected to complete the following courses, unless equivalent educational experience has been obtained previously: Biochemistry 501, 502, 517, 561, 562, 566, 572, 575, 583, and 584 (a minimum of 26 hours). Students will be responsible for the content of these courses in their Admission to Candidacy Examination (see below). Students may also be required to take courses in other fields which are fundamental to their education in biochemistry. These requirements will be determined by the graduate advisory committee. Most, if not all, students will pursue advanced studies in chemistry and biology. Correction of any deficiencies in physical chemistry or organic chemistry must be completed within the first year of residence. Once the student selects a thesis advisor, the individual faculty advisor may require additional course work of a more specialized nature. All such additional courses must be completed prior to the Admission to Candidacy Examination.

Six procedures are used in the evaluation of a graduate student's progress. (1) At the completion of the first two semesters in residence, each student's course record, motivation, and general competence will be reviewed at a meeting of the entire faculty. A graduate student in biochemistry is required to maintain at least a B average to continue in the program. (2) Continual review of research progress will be made by the thesis advisor. (3) A written and oral research progress review examination will be held each year by three members of the student's Progress Review Committee which excludes his or her thesis advisor. (4) All students are required to present a research seminar in Biochemistry 581 or 582 at least once a year until they have submitted a completed doctoral thesis. (5) An oral Admission to Candidacy Examination shall be completed prior to the beginning of the student's sixth semester of residence. (6) The final written Ph.D. thesis will be reviewed by the student's thesis committee and defended orally in a public seminar. A detailed description of these examinations and reviews can be obtained from the Departmental office.

B. Master of Arts Degree Program in Biochemistry. The formal course requirements for a candidate for the Master of Arts degree will be determined by the graduate advisory committee. As in the case of Ph.D. candidates, all students will be expected to complete the following courses, unless equivalent educational experience has been obtained previously: Biochemistry 501, 502, 517, 561, 562, 566, 572, 575, 583, and 584 (26 hours). In addition to these courses, students will be required to take courses in other fields which are fundamental to their education in biochemistry or which are required for pursuit of the student's thesis research. Students must achieve an overall average of B in the formal courses offered by the Department to be a candidate for the M.A. degree. The student's overall performance will be evaluated by the faculty as a whole after the second semester in residence.

One progress review session will be held for M.A. students during their second full year of residence. This research review session will be identical in format to that for the

Ph.D. students but, in the case of M.A. students, replaces the admission to candidacy examination since no other preliminary examination will be held prior to the final oral defense of the Master's thesis. Master of Arts degree candidates are required to submit a formal written thesis. The final examination will consist of a public oral presentation of the research work to the thesis committee members followed by a question and answer session.

Biochemistry Courses

201a,b. Independent Study in Biochemistry for Undergraduates(0-TBA-2 each semester).
Independent program of study and research for students with previous training in biochemistry. Requires permission of supervising faculty member and the departmental chair.
Ms. Matthews

361a. General Biochemistry (4-0-4).
The chemistry, biological functions, and metabolism of molecules in living cells. Topics include enzymic catalysis, metabolic control, and energy production and utilization. Prerequisite: Chemistry 211, 212.
Mr. Olson, Mr. Palmer

362b. General Biochemistry (4-0-4).
A continuation of Biochemistry 361a. Topics include nucleic acid structure and function, molecular biology, and metabolic regulation. Prerequisite: Biochemistry 361.
Ms. Matthews, Mr. Rudolph

367a,b. Experimental Biochemistry (1-9-4).
Modern techniques of biochemical investigation: chemistry of lipids, carbohydrates, nucleic acids; separation techniques; spectroscopy; measurement and safe handling of radioisotopes; enzyme purification and methods of kinetic analysis. Prerequisite: Biochemistry 361.
Mr. Cooper, Mr. Rudolph; Mr. Cooper, Ms. Beckingham

401a. Undergraduate Research (0-15-5).
Open only to undergraduate majors with the permission of the research supervisor and the chair. Prerequisite: Biochemistry 361, 362, 367, and concurrent enrollment in Biochemistry 411.

402b. Undergraduate Research (0-15-5).
See Biochemistry 401.

411a. Undergraduate Research Seminar (1-0-1).
Discussion of current research in area under investigation. Prerequisite: enrollment in Biochemistry 401.
Ms. Matthews

412b. Undergraduate Research Seminar (1-0-1).
See Biochemistry 411. Prerequisite: enrollment in Biochemistry 402.
Ms. Matthews

461a. Biochemistry of the Gene (3-0-3).
A survey of the structure, expression, and regulation of procaryotic and eucaryotic genes. Prerequisite: Biochemistry 361, 362.
Mr. Bennett, Ms. Beckingham

462b. Physical Biochemistry (3-0-3).
A survey of the application of biophysical techniques to biological problems. Topics include: X-ray crystallography, kinetics, magnetic resonance techniques, and enzyme mechanisms. Prerequisite: Biochemistry 361.
Mr. Olson, Mr. Palmer

466b. Advanced Experimental Biochemistry (1-9-4).
An advanced laboratory course using modern molecular biological and biophysical techniques. Prerequisite: Biochemistry 461, concurrent enrollment in Biochemistry 462, and consent of instructor. Limited enrollment.

Mr. Bennett

472b. Biochemistry of Antibiotics and Sterols (3-0-3).
Advanced lectures on current research in certain specialized fields of biochemistry. Prerequisite: Biochemistry 361 and completion or concurrent enrollment in Biochemistry 362.

Mr. Schroepfer, Mr. Walker

501a. General Biochemistry for Graduate Students(4-0-4).
Chemical nature of molecules in living cells and their biological functions; biosynthesis and degradation; mechanisms and stereochemistry of enzymic catalysis; metabolic control, energy production, and utilization. Prerequisite: graduate status, one year of organic chemistry.

Mr. Olson, Mr. Palmer

502b. General Biochemistry for Graduate Students(4-0-4).
A continuation of Biochemistry 501. Topics include molecular biology, gene expression, regulation of metabolism, and physiology. Prerequisite: Biochemistry 501.

Ms. Matthews, Mr. Rudolph

517a,b. Experimental Biochemistry (1-9-4).
Modern techniques of biochemical investigation: chemistry of lipids, carbohydrates, nucleic acids; separation techniques; spectroscopy; measurement and safe handling of radioisotopes; enzyme purification and methods of kinetic analysis. Prerequisite: Graduate status and enrollment in Biochemistry 501 or equivalent.

Mr. Cooper, Mr. Rudolph; Mr. Cooper, Ms. Beckingham

561a. Biochemistry of the Gene (3-0-3).
A survey of the expression and regulation of procaryotic and eucaryotic genes. Prerequisite: Biochemistry 501, 502 or equivalent and graduate status.

Ms. Beckingham, Mr. Bennett

562b. Physical Biochemistry (3-0-3).
The application of biophysical techniques to biological problems. Prerequisite: Biochemistry 501 or equivalent.

Mr. Olson, Mr. Palmer

566b. Advanced Experimental Biochemistry (1-9-3).
A graduate laboratory course using modern molecular biological and biophysical techniques. Prerequisite: Biochemistry 561, concurrent enrollment in Biochemistry 562, and consent of instructor. Limited enrollment.

Mr. Bennett

572b. Biochemistry of Antibiotics and Sterols (3-0-3).
Prerequisite: Biochemistry 501 or equivalent.

Mr. Schroepfer, Mr. Walker

575a. Introduction to Research (0-3-1).
Introduction to first-year graduate students of the research programs and laboratories of individual faculty members.

Ms. Matthews

581a. Graduate Seminar (1-0-1).
A discussion of selected research topics.

Ms. Matthews

582b. Graduate Seminar (1-0-1).
See Biochemistry 581.

Ms. Matthews

583a. First-Year Graduate Seminar (1-0-1).
Presentation of seminars on current biochemical research.

Ms. Matthews

584b. First-Year Graduate Seminar (1-0-1).
Continuation of Biochemistry 583.

Ms. Matthews

611a. Research Seminar (3-0-3).
Discussion of individual laboratory research. Prerequisite: Biochemistry 800.

612b. Research Seminar (3-0-3).
Continuation of Biochemistry 611.

621a. Thesis Seminar (1-0-1).

622b. Thesis Seminar (1-0-1).

800a,b. Graduate Research (Variable).

Biology

Professor Glantz, *Chair*
Professors Campbell, F.M. Fisher, Harcombe, Philpott, Sass, C.R. Stewart, Subtelny, and C.H. Ward
Adjunct Professors Brown and Sperling
Associate Professor J.E. Strassmann
Assistant Professor J.P. Martin
Adjunct Associate Professor Schroder
Laboratory Director Vorhaben

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Biology majors are required to take eight semester hours in introductory mathematics (Mathematics 101, 102 or 121a, 122b), seven semester hours of introductory physics (Physics 101a, 102b, and 132b or 111a, 112b, and 132b; or 121a, 122b, 123a, or 124b), eight semester hours of introductory chemistry (Chemistry 101a, 102b, and 107), eight semester hours of organic chemistry (Chemistry 211a, 212b, and 213a, 214b), eight semester hours of general biochemistry (Biochemistry 361 and 362), and the following courses in biology: Biology 201a, 202b, 203a, 322a, 360b, and 384b. They must take at least four additional advanced biology courses (300-level or higher) for a total of 69 semester hours, plus 60 semester hours beyond the biology requirements.

Students interested in research should contact the departmental undergraduate adviser prior to enrolling in Biology 401a or 401b or 401c and 405a or 405b.

Students may, under exceptional circumstances, receive credit for research done outside of Rice *only if they have received in advance the authorization of the departmental undergraduate adviser.* They should enroll in Biology 403. *Either Biology 401 or 403 may be taken (but not both) and no more than four semester hours may be applied to the requirements for a biology major.*

Students interested in laboratory teaching should contact the laboratory instructor prior to enrolling in Biology 402a or 402b.

Students interested in taking a graduate (500-level) course must obtain the consent of the instructor prior to enrollment.

Either Biology 402 or a 500-level course may be taken (but not both) and no more than four semester hours may be applied to the requirements for a biology major.

Premedical. Premedical students who are not majoring in biology are advised to take the following courses: Biology 201a, 202b, 203a, and 360b. They may wish to take Biology 122b for review purposes.

Biology courses required for distribution requirements. Biology 122a (Fundamental Concepts of Biology) is the only course designed for nonmajors and thus cannot be used for biology credit toward a biology major.

Biology 201a and 202b (Introductory Biology) does not require a prerequisite.

Biology 311a (Animal Behavior and Evolution) is recommended to students in the social sciences.

Recommended Schedule of Courses.

First year:	Mathematics, physics, and chemistry.
Second year:	Organic chemistry, Biology 201a, 202b, and 203a.
Third year:	Biochemistry 361a, 362b, and Biology 384b.
Third and fourth year:	Biology 322a, 360b, and advanced electives.

Biology 203a (Laboratory in Experimental Biology) should be taken in the sophomore year and Biology 384b (Laboratory in Advanced Experimental Biology) in the junior year. Students enrolling in these courses should sign up for section assignments in Room 141A Biology at the time of preregistration.

Transfer credit. Students must complete more than 50 percent of the advanced level requirements in their major field at Rice. This is a minimum.

Transfer credit for no more than 14 semester hours taken during the summer in an accredited college or university other than Rice is granted if the courses are individually acceptable for transfer credit. All transfer students must earn at least 60 semester hours at Rice, regardless of the amount of transfer credit awarded, and spend at least four semesters in residence.

For more information consult page 69 of this bulletin. Students desiring transfer credit for a biology course should contact the undergraduate adviser.

Graduate Program. The graduate program is open to qualified applicants who hold a bachelor's degree or equivalent. Prospective graduate students must take the Graduate Record Examination, including the advanced examination in biology. The entering student generally is expected to have a strong background in one of the several areas of biology; in addition, completion of courses in physics (one year), mathematics (including calculus), chemistry (including organic), and biochemistry is required. The above requirements do not preclude admission of qualified applicants who have majored in areas other than biology. Any deficiencies should be made up no later than the first year of residence in graduate study, including the first summer. It is strongly recommended that deficiencies be made up during the summer preceding the first semester of residence. An orientation examination is administered during the first year. Students entering with the master's degree are normally exempt from this examination.

Requirements for the Degree of Master of Arts. The degree of Master of Arts may be obtained after the completion of 30 semester hours of graduate study, six hours of which must be earned by the completion and public defense of a thesis embodying the results of an original investigation.

Requirements for the Degree of Doctor of Philosophy. In addition to the general University requirements for advanced degrees (pages 106-113), the following departmental requirements must also be met.

1. Three or more years of graduate study with at least two years in residence at Rice

2. An original investigation worthy of publication in a scientific journal and a doctoral thesis as described in the *General Announcements*
3. A grade average of "B" or better in courses taken in the department and satisfactory grades in courses taken outside the department
4. Satisfactory performance in Biology 503 for at least four semesters
5. Satisfactory performance on a candidacy examination administered by the advisory committee; this examination may be oral and/or written
6. Public defense of the thesis
7. Presentation of a departmental seminar on the candidate's research

Fellowships. A limited number of graduate fellowships are available on a competitive basis.

Biology Courses

122a. Fundamental Concepts of Biology (3-0-3).
A survey for non-majors of the basic principles of cell biology, cell chemistry, metabolism, genetics, developmental biology, physiology, and population biology.
Mr. Subtelny

201a. Introductory Biology (3-0-3).
Principles of cell biology, cell chemistry, metabolism, physiology, and behavior. May be taken either before or after Biology 202.
Mr. Sass

202b. Introductory Biology (3-0-3).
Principles of Mendelian, molecular, and population genetics, development, evolution, ecology, and organismic diversity. May be taken either before or after Biology 201.
Mr. Fisher, Mr. Philpott

203a. Laboratory in Experimental Biology (1-3-2).
Experimental approaches to the study of morphology, function, and behavior in animal systems. Students must sign up for section assignments at time of preregistration.
Ms. Vorhaben, Mr. Philpott, Ms. Strassmann, Mr. Subtelny

302b. Developmental Biology (3-0-3).
Analysis of processes and principles in development of organisms at the molecular, cellular, and tissue level of organizations. Prerequisite: Biology 201, 202 or permission of instructor.
Mr. Subtelny

311a. Animal Behavior and Evolution (3-0-3).
Evolutionary theory is used to evaluate behavior adaptations of organisms to their environment.
Ms. Strassmann

313a. Laboratory in Animal Behavior (1-3-2).
Field and laboratory studies of fireflies, hummingbirds, guppies, and more. Not offered every year. Corequisite: Biology 311.
Ms. Strassmann

322a. General Cell Physiology (3-0-3).
Basic principles and mechanisms of cell physiology. Special emphasis on physical and chemical mechanisms of cellular and subcellular processes. Prerequisite: introductory physics and chemistry. Corequisite: Biochemistry 361 or permission of instructor.
Mr. Glantz

341a. Ecosystem Biology (4-0-4).
Analysis of population dynamics, species interactions, plant and animal community organization, and ecosystem function.
Mr. Harcombe

343a. Ecosystem Biology Laboratory (1-3-2).
Field studies of natural ecosystems. Some Saturday field trips required. Corequisite: Biology 341.

Mr. Harcombe

350b. Plant Biology (3-0-3).
Analysis of the physiology, morphology, and evolution of plants in terms of adaptation to environment. Not offered every year.

Mr. Harcombe, Mr. Ward

352b. Laboratory in Plant Biology (1-3-2).
Field and laboratory studies of plant adaptation to environment. Limited to twenty students. Corequisite: Biology 350 or permission of instructor. Not offered every year.

Mr. Harcombe

355a. Animal Biology (3-0-3).
The evolution and systematics of animals with consideration of their functional morphology, physiology and behavior. Prerequisite: Biology 201 and 202.

Mr. Fisher

360b. Genetics (3-0-4).
Analysis of the structure, function, and transmission of the genetic material. It is strongly recommended that Biochemistry 362 be taken either before or at the same time.

Mr. Stewart

381a. Cell Biology (3-0-3).
The morphology and function of cell components; cells and tissues as revealed by light and electron microscopy and associated histo- and cytochemical methods. Prerequisite: Biochemistry 361 or permission of instructor.

Mr. Philpott

384b. Laboratory in Advanced Experimental Biology (1-6-3).
Advanced experimental techniques in electrophysiology, microbiology, cell biology, and genetics. Students must sign up for section assignment at time of preregistration. Prerequisite: Biology 322.

Mr. Glantz, Mr. Martin, Ms. Vorhaben

401a,b,c. Undergraduate Research (Variable).
Normally limited to senior biology majors with superior academic records. Prerequisite: Permission of undergraduate adviser. Corequisite: Biology 405.

Mr. Subtelny

402a,b. Undergraduate Teaching (Variable).
Normally limited to advanced biology majors with superior academic records. Prerequisite: Permission of laboratory instructor.

Mr. Subtelny

403a,b. Special Topics (Variable).
Used for transfer credit and other special circumstances. Permission of undergraduate adviser required.

Mr. Subtelny

405a,b. Research Seminar (1-0-1).
Discussion of contemporary research areas in the biological sciences. Required for students enrolled in Biology 401.

Staff

428b. Endocrinology (3-0-3).
A study of the primary endocrine glands of vertebrates and the function of their hormonal products.

Mr. Campbell

471b. Microbiology (3-0-3).
Structure and function of microorganisms with emphasis on bacteria. Corequisite: Biochemistry 361 or consent of the instructor.
Mr. Williams

501a,b. Graduate Seminar (1-0-1).
General departmental seminar. Required of all graduate students.
Mr. Glantz

503a,b. Graduate Teaching (3-0-3).
Supervised instruction in teaching the various areas of biology. Prerequisite: graduate standing in biology.
Mr. Glantz

511b. Evolutionary Biology (3-0-3).
A discussion of research literature on topics of current interest. Prerequisite: Biology 311 and permission of instructor.
Ms. Strassmann

533a,b. Special Projects in Developmental Biology(0-6-3).
Laboratory training in experimental manipulations on developing embryos; supervised individual research projects. Prerequisite: Biology 302 and permission of instructor.
Mr. Subtelny

534a. Advanced Developmental Biology (3-0-3).
Seminars on selected topics of current interest in developmental biology. Prerequisite: Biology 302 and permission of instructor.
Mr. Subtelny

543b. Marshland and Estuarine Biology (3-3-4).
Student reports, conferences, and field work on the physical composition and biota of nearby coastal environments. Field trips on weekends. Prerequisite: Permission of instructor. Not offered every year.
Mr. Fisher

547a. Topics in Ecosystem Biology (3-0-3).
Discussion, seminars, and projects concerning organization, structure, and function of ecosystems. Prerequisite: Permission of instructor.
Mr. Harcombe

569b. Topics in Molecular Genetics (3-0-3).
Student seminars analyzing recent research on a subject of current interest in microbial genetics and molecular biology. Prerequisite: Permission of instructor.
Mr. Stewart

580a. Cell Biology (2-6-4).
Study of cells and cell phenomena and interpretation of observations. Advanced laboratory and seminar. Prerequisite: Biology 322, 381, Biochemistry 361 and permission of instructor.
Mr. Philpott

582a. Topics in Cell Biology (3-0-3).
Discussion of recent literature. Prerequisite: Biology 381 and 384 or permission of instructor.
Mr. Philpott

601a,b. Graduate Research (Variable).
Independent research open to first-year graduate students.
Mr. Glantz

800a,b. Thesis Research (Variable).
Mr. Glantz

Chemistry

Professor W. E. Billups, *Chair*
Professors Berry, Brooks, Curl, Engel, Glass, Hayes, Kinsey
Lewis, Margrave, Parry, Sass, Schroepfer, Smalley, and L. J. Wilson
Adjunct Professor Willcott
Associate Professors Fukuyama and Weisman
Adjunct Associate Professor Kasper
Assistant Professors Burgess, Ciufolini, D'Evelyn, Hutchinson, Pegg and Whitmire

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduates electing chemistry as a major are expected to take the following courses in their first year: Mathematics 101, 102 (or equivalent honors courses); Physics 101, 102 (or equivalent honors courses) 132; Chemistry 101, 102 (or equivalents), and 107. In general, they take Chemistry 211, 212 and 213, 214; Physics 201, 202 (or equivalents), and 231; and Mathematics 211, 212 (or equivalents) in the sophomore year. The Department further requires satisfactory completion of the following courses:

Junior and Senior Years
Chemistry 311, 312 and 313, 314
Chemistry 401 and 403
Chemistry 430
Chemistry 460 or 495

Two additional courses in advanced chemistry, physics, mathematics, mathematical sciences, or biochemistry. Superior students may substitute undergraduate research (Chemistry 491, 492) for one or two semesters of classroom instruction.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 133 semester hours. See Degree Requirements and Majors, pages 54-68.

American Chemical Society Certification. The Rice Department of Chemistry is on the approved list of the Committee on Professional Training of the American Chemical Society and as such can certify that graduates have met the appropriate standards. For certification, two additional advanced courses are required. Chemistry 460 and 495 are both required; one can be counted as an advanced course. A foreign language, preferably German, is recommended.

Accelerated Ph.D. Plan. Because of the high level of training provided in the Rice B.A. program, it is possible for certain especially qualified undergraduate students to be admitted to an accelerated program that could lead to the Ph.D. degree in about two years after completion of the B.A. program. In order to complete the work in this time, the student initiates research during the summer following the junior year and continues research by taking Chemistry 491, 492 during the senior year. The student may start taking cumulative examinations during the senior year and should be able to complete all courses and examinations before the end of the second year after the B.A. The student may, in favorable cases, be able to complete the thesis in this time as well.

Interdepartmental Majors. An interdepartmental major in chemical physics is offered jointly with the Physics Department. Advice about this program should be obtained

from both departments. Double majors with several other departments, such as biochemistry, materials science, physics, and mathematics have also been used since the programs have many required courses in common.

Graduate Program. Students who have completed work equivalent to that required for the bachelor's degree in chemistry offered at Rice University may be admitted to graduate standing. Preference is normally given to applicants who earn high scores on the Graduate Record Examination, including the advanced test in chemistry (see page 106). A minimum of two years of graduate study is required for the degree of Doctor of Philosophy. A nominal amount of undergraduate teaching is normally considered an integral part of the graduate program.

Candidates for the degree of Master of Arts are required to complete six one-semester courses, present in a thesis the results of a program of research approved by the department, and pass a final oral examination.

Candidates for the degree of Doctor of Philosophy must complete for publication a thesis which represents a distinctly original and significant contribution to the field of chemistry. Candidates must further have acquired through course work and independent study a broad fundamental knowledge of chemistry in addition to those areas of the subject encompassed by their own research interests. Cumulative examinations for the Ph.D. degree are given periodically, and a final oral examination on the thesis is required for all candidates.

Chemistry Courses

101a. Introductory Chemistry (3-0-3).
The basic phenomena and principles of chemistry. Normally taken with Chemistry 107. With Chemistry 102, the three courses (or equivalent) are prerequisite to advanced courses in chemistry. Prerequisite: high school chemistry.

Mr. Glass

102b. Introductory Chemistry (3-0-3).
See Chemistry 101. Prerequisite: Chemistry 101

Mr. Whitmire

106b. Honors Laboratory (0-4-1).
Independent projects in synthesis and characterization of compounds. Prerequisite: Chemistry 101, 107, and permission of instructor.

Mr. Wilson

107a,b. Analytical Chemistry Lab (1-4-2).
Volumetric, gravimetric, and instrumental methods of inorganic quantitative analysis. Normally taken with Chemistry 101, 102. The three courses (or equivalent) are prerequisite for advanced courses in chemistry. (One lab per week)

Mr. Brooks, Mr. Curl

211a. Organic Chemistry (3-0-3).
Aliphatic and aromatic organic chemistry with emphasis on structure, bonding, and reaction mechanisms. Second semester: greater emphasis on the chemistry of various functional groups. Normally accompanied by Chem 213, 214. Chemistry 212 must be preceded by Chemistry 211. Prerequisite: Chemistry 101, 102.

Mr. Billups

212b. Organic Chemistry (3-0-3).
See Chemistry 211. Prerequisite: Chemistry 211.

Mr. Engel

213a. Organic Chemistry Lab (0-4-1).
Synthesis, purification, and characterization of organic compounds. Experiments related to topics covered in Chemistry 211, 212. Second semester includes identification of unknown organic compounds. (One hour lecture precedes each lab.) One lab per week. Corequisite: Chemistry 211, 212. Prerequisite: Chemistry 107.

Mr. Lewis, Mr. Parry

214b. Organic Chemistry Lab (0-4-1).
See Chemistry 213. Prerequisite: Chemistry 213.

Mr. Lewis, Mr. Parry

311a. Physical Chemistry (3-0-3).
First semester: principles of thermodynamics, including topics of equilibria, theory of solutions, and electrochemistry. Prerequisite: Mathematics 211, 212; Physics 101, 102 (Physics 201, 202 or 211, 212 recommended); Chemistry 101, 102.

Mr. Hutchinson

312b. Physical Chemistry (3-0-3).
Elements of quantum chemistry, spectroscopy, statistical thermodynamics, kinetic theory of gases, reaction kinetics, and properties of liquids and solids.

Mr. D'Evelyn

313a. Experimental Physical Chemistry (1-4-2).
Experiments illustrating techniques employed in high resolution optical spectroscopy, electrochemistry, calorimetry, surface area measurements, and kinetics. Lab meets alternate weeks. Prerequisite: Chemistry 107, 311; Physics 132, 231.

Mr. D'Evelyn

314b. Advanced Instrumental Laboratory (0-8-2).
Principles and application of modern instrumental methods to inorganic and physical chemistry. Prerequisite: Chemistry 311 and 313.

Mr. Glass

401a. Advanced Organic Chemistry (3-0-3).
The course develops, in detail, the concepts of modern organic chemistry. A major portion is devoted to reactions of synthetic importance. Prerequisite: Chemistry 211, 212.

Mr. Fukuyama

403a. Advanced Organic Laboratory (1-8-2).
Covers the techniques of modern organic chemistry. Designed to accompany Chemistry 401. Prerequisite: Chemistry 212, 213, 214.

Mr. Burgess

411b. Spectral Methods in Organic Chemistry (3-0-3).
Elucidation of organic structures by physical techniques. Interpretation of infrared, ultraviolet, nuclear magnetic resonance, and mass spectra. Prerequisite or corequisite: Chemistry 401.

Mr. Ciufolini

415a. Chemical Kinetics (3-0-3).
Measurement of reaction rates, phenomenological and theoretical treatment of kinetics of simple and chain reactions. Prerequisite: Chemistry 311, 312.

Mr. Weisman

420b. Statistical Thermodynamics (3-0-3).
A development of the equilibrium theory of statistical mechanics. Applications to imperfect gas theory and the calculation of thermodynamic properties of matter. Prerequisites: Chemistry 311, 312, 430; Mathematics 211, 212; Physics 201, 202, or 211, 212. Also offered as Civil Engineering 540.

Mr. Robert

430a. Quantum Chemistry (3-0-3).
Quantum mechanics, atomic structure, the nature of the chemical bond. Prerequisite: Mathematics 211, 212; Physics 101, 102 and 201 or 211, 212; Chemistry 311.

Mr. Curl

445a. Physical-Organic Chemistry (3-0-3).
Organic reaction mechanisms, substituent and medium effects, linear free energy relations and acidity functions. Corequisite: Chemistry 401. Prerequisite: Chemistry 311, 312.

Mr. Engel

460b. Inorganic Chemistry (3-0-3).
Survey of the periodic table; atomic and molecular structure; bonding in covalent, ionic, and electron deficient systems; thermochemical principles and experimental techniques for analysis, structure determination, and synthesis. Prerequisite: Chemistry 211, 212, 213, 214.

Mr. Margrave

471b. Molecular Spectroscopy (3-0-3).
The spectra of simple molecules, including microwave, infrared, visible, ultraviolet, and Raman spectra; introductory aspects of molecular symmetry and group theory; resonance spectroscopy. Prerequisite: Chemistry 430 or equivalent.

Mr. Smalley

491a. Research for Undergraduates (Variable).
Open only to chemistry majors with superior records and with the permission of the chairman. Written report required.

Staff

492b. Research for Undergraduates (Variable).
See Chemistry 491.

Staff

495a. Transition Metal Chemistry (3-0-3).
Structure, bonding, and reactivity of coordination and organometallic compounds; Ligand Field Theory; electronic spectroscopy; magnetism; reaction mechanisms; catalysis. Chemistry 460 recommended. Prerequisite: Chemistry 311, 312.

Mr. Wilson

521a. Chemical Thermodynamics (3-0-3).
An intensive review of thermodynamics designed primarily for first-year graduate students. Prerequisite: Chemistry 311, 312, or equivalent.

Mr. Hutchinson

561a. Advanced Organic Chemistry (3-0-3).
Organic mechanisms, modern structure theory, and synthetically important reactions; designed primarily for first-year graduate students.

Mr. Fukuyama

562b. Advanced Organic Chemistry (3-0-3).
See Chemistry 561.

Mr. Burgess

590b. Topics in Physical Chemistry (3-0-3).

596b. Topics in Inorganic Chemistry (3-0-3).
A variety of courses in advanced inorganic chemistry. Recent subjects have included fluorine chemistry, boron chemistry, physical methods in inorganic chemistry, radiochemistry, and advanced descriptive inorganic chemistry.

611a. High Temperature and High Pressure Chemistry (3-0-3).
The techniques for generation and measurement of high temperature and high pressures and of the nature of phenomena under extreme conditions.

Mr. Margrave

652b. Quantum Mechanics (3-0-3).
A development of the elements and techniques of quantum mechanics with applications to atomic and nuclear systems. Prerequisite: Chemistry 430.

Mr. Hutchinson

800a,b. Graduate Research (Variable).

Mr. Billups

Economics

Professor G.W. Smith, *Chair*
Professors Brito, Bryant, Huddle, Mieszkowski, Rimlinger, Sickles, Soligo and Young
Associate Professors Brown, Hartley, Hirschey, and Zodrow
Adjunct Associate Professors Lairson and Swint
Assistant Professors Chae, and Strassmann

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduates may major in either economics or mathematical economic analysis.

Economics majors are required to take a minimum of ten courses including nine in Economics plus one in quantitative methods as specified in (5) below.

Course requirements include:

1. Economics 211 and 212;
2. Economics 370 or 372;
3. Economics 375;
4. At least three of the following: Economics 301, 355, 415, 416, 417, 420, 430, 435, 436, 438, 440, 445, 448, 450, 455, 461, 483, 485, 486
5. One course in quantitative methods selected from Economics 350, 400, 471, 475, 476, Mathematical Sciences 223, 301, 380, 381, 382, 480, 481, Computer Science 211, and Accounting 305 or an approved equivalent.
6. No more than three of the nine Economics courses may be transferred from other schools. Additional transfer credits in Economics may count toward meeting University graduation requirements but not toward fulfillment of the departmental major requirements. The required course in quantitative analysis may also be transferred.

Mathematical economic analysis majors are required to take a minimum of 15 courses, including:

1. Economics 211, 212, 372, 375;
2. At least three of the following: Economics 301, 355, 415, 416, 417, 420, 430, 435, 436, 438, 440, 445, 448, 450, 455, 461, 480, 483, 485, 486;
3. Economics 400.
4. Mathematics 101 and 102 (or 121 and 122), 212, either Mathematics 211 or 355 or Mathematical Sciences 310, and either Mathematical Sciences 382 or 480 or 481;
5. At least one of the following: Economics 440, 471, 472, 475, 476, 477, 478; Mathematical Sciences 451, 460, 472, 485, 486, 487, 488, or an approved equivalent;
6. At least one research course, with prior approval, selected from: Economics 403, 404, 495, 496, or a graduate course.

7. Students may graduate with "Honors in Economics" by achieving a B+ (3.33) average in all Economics courses and writing a senior thesis while taking Econ. 403 and 404 (two semesters of independent research).

The major in Mathematical Economic Analysis is recommended for students intending to do graduate work in economics. Additional information regarding major requirements can be obtained from the departmental office.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Graduate Program. Admission to graduate study in economics is granted each year to a limited number of students who hold an undergraduate degree (or the equivalent), whether in economics or another field. The graduate program is designed primarily for students qualified to pursue a course of study leading to the Ph.D. degree.

Training in mathematics including at least two semesters in calculus and one in linear algebra is a prerequisite for admission to the Ph.D. program. Students who have not met these requirements may be admitted to the master's program or may take these prerequisites as Class III students. All applicants are required to take the Graduate Record Examination.

Candidates for the Ph.D. degree who have good undergraduate preparation in economics should expect to devote two to two and one-half years to full-time course work plus a minimum of one additional year for the completion of the dissertation.

Requirements for the Degree of Master of Arts:

1. Demonstrate proficiency in the use of statistics.
2. Complete an approved program of at least six courses including at least three 500-level graduate courses. A total of 30 semester hours (including 6 hours for the thesis and 24 for courses), 24 of which must be in residence at Rice, is required. Candidates for the master's degree should expect to devote a minimum of one year to full-time course work.
3. Complete and defend orally a thesis presenting in prescribed form the results of original research.

Requirements for the Degree of Doctor of Philosophy:

1. Demonstrate proficiency in statistics, elementary mathematical economics, and economic history or history of economic thought;
2. Complete an approved program of at least 14 courses. At least two years of full-time study, or the equivalent of 60 semester hours, must be in residence at Rice. Candidates for the Ph.D. degree who have good undergraduate preparation in economics should expect to devote two to two and one-half years to full-time course work plus a minimum of one additional year for the completion of the dissertation. Completing the program in four years is a reasonable goal.
3. Perform satisfactorily on written general examinations in economic theory;
4. Demonstrate proficiency in a major field by:
   a. Taking the relevant courses in that field;
   b. Performing satisfactorily on a written field examination.
   Fields may be chosen from the following areas of interest: (1) econometrics, (2) economic development and history, (3) economic theory, (4) industrial organization and regulation, (5) international trade and finance, (6) mathematical economics, (7) monetary economics, (8) or public finance.
5. Complete and defend orally a doctoral dissertation setting forth in publishable form the results of original research.

Economics Courses

211a,b. Principles of Microeconomics (3-0-3).
Nature of economics; the price system; household decisions; cost and supply; marginal productivity and capital theory; industrial organization and control; economic efficiency, externalities, and public goods.

Staff

212a,b. Principles of Macroeconomics (3-0-3).
Measurement and determination of national income; money, banking, and fiscal policy; business cycles, unemployment, and inflation; international trade and balance of payments; other contemporary economic problems. Prerequisite: Economics 211.

Staff

301a. History of Economic Analysis (3-0-3).
The fundamental ideas of great economic thinkers from Plato to the present. Prerequisite: Economics 211. Not offered every year.

Mr. Rimlinger

350a. Elements of Statistical Method (3-0-3).
Basic concepts and techniques in probability theory and statistical inference. A student taking Economics 350 may not also receive credit for Mathematical Sciences 280. Prerequisite: Economics 211.

Mr. Sickles

355a. Money and Banking (3-0-3).
Demand and supply of money and other financial assets. American and international institutional trends and reforms.

Staff

370a,b. Microeconomic Theory (3-0-3).
Intermediate level analysis of markets, firms, households, income distribution, and general equilibrium. Prerequisite: Economics 211.

Mr. Zodrow, Mr. Mieszkowski

372b. Mathematical Microeconomics (3-0-3).
Mathematical approach to microeconomic theory. Recommended for mathematically oriented students. Students may not receive credit for both Economics 370 and 372. Prerequisites: Economics 211, Mathematics 101, 102.

Mr. Brito

375a,b. Macroeconomic Theory (3-0-3).
Intermediate level analysis of relationships between the levels of income, employment, interest, investment, consumption, and government spending. Prerequisites: Economics 211, 212.

Staff

400b. Econometrics (3-0-3).
Estimation and forecasting models; topics include multiple regression time series, contingency table analysis, and Bayesian inference. Prerequisite: Economics 350 or Mathematical Sciences 380, 381 or 382.

Mr. Brown

403a. Senior Independent Research (3-0-3).
Independent research project for seniors on an approved topic of their own choosing. Prerequisite: permission of instructor.

Mr. Zodrow

404b. Senior Independent Research (3-0-3).
See Economics 403.

Mr. Zodrow

415b. Human Resources, Wages, and Welfare (3-0-3).
Study of labor markets and wage determination. Special emphasis on "investment in human capital" through education, training, and health services. Prerequisite: Economics 211.
Mr. Huddle

416. Economic History of the U.S.: 1700-1945 (3-0-3)
Economic history of the United States from the Colonial Period to the end of World War II. Attention focuses upon the trends in per capita income and the forces behind these trends. Prerequisite: Economics 211. Not offered every year.
Mr. Rimlinger

417. Comparative History of Industrialization (3-0-3)
Comparative historical analysis of industrialization of Western Europe, the United States, and Russia from the eighteenth century to World War I. Prerequisite: Economics 211. Not offered every year.
Mr. Rimlinger

420b. International Economics (3-0-3).
Economic relationships between countries. Trade theory. Tariffs and other trade restrictions. International finance, exchange rates, monetary and fiscal policy. Current policy issues in trade and finance. Prerequisites: Economics 211, 212, 370 or 372, 375.
Mr. Smith

430a. Comparative Economic Systems (3-0-3).
Theoretical models of various economic systems as a basis for analyzing the operation and the institutional characteristics of economies including the U.S., the U.S.S.R., Yugoslavia, and China. Prerequisite: Economics 211.
Mr. Soligo

435a. Industrial Organization (3-0-3).
Market structure, concentration, barriers to entry, and ologopoly pricing. Application of micro theory to industry problems. Prerequisite: Economics 211 or permission of instructor.
Ms. Strassmann

436b. Government Regulation of Business (3-0-3).
Analysis of governmental regulatory activities under antitrust laws and in such regulated industries as communications, energy, and transportation. Prerequisite: Economics 211; 370 and 435 recommended.
Mr. Johnson

438. Economics of the Law (3-0-3).
The role of economic reasoning in understanding the enactment, interpretation, and enforcement of the law. Applications to contracts, property, torts, discrimination, and criminal justice. Prerequisite: Economics 211.
Mr. Soligo

440b. Economics of Uncertainty (3-0-3).
Decision making under uncertainty with applications to the choice of financial assets, the operation of insurance markets, research in markets with imperfect information and the microeconomic foundations of macroeconomics. Prerequisites: Economics 211, 212; Mathematics 101, 102 and some familiarity with probability theory as gained in Economics 350, Mathematical Sciences 380, 381 or 382.
Mr. Hartley

445a. Managerial Economics (3-0-3).
Application of economics to decision making within the firm; organization theory, cost, pricing, and problems of control. Economics 212 desirable. Prerequisite: Economics 211.
Mr. Johnson

448a,b. Corporation Finance (3-0-3).
Financial analysis, planning, and control in modern corporations; includes valuation, cost and allocation of capital, capital markets. Prerequisites: Economics 211 and Accounting 305.
Staff

450a. World Economic and Social Development (3-0-3).
Examines past and future development in advanced and poor countries emphasizing resources, population, entrepreneurship, education, and planning. Prerequisites: Economics 211, 212. Not offered every year.

Mr. Huddle

455b. Money and Financial Markets (3-0-3).
Determinants of the demand and supply of money, bonds, stocks, and other financial assets. Financial intermediaries. Monetary policy. Inflation. International linkages of financial markets. Prerequisite: Economics 375.

Mr. Bryant

461b. Urban Economics (3-0-3).
Economic analysis of the development and problems of urban areas with particular attention to current policy issues. Prerequisite: Economics 211 or permission of instructor.

Mr. Mieszkowski

471a. Linear Programming (3-0-3).
Formulation of managerial and technical problems; simplex method; revised simplex method; duallilty theory and applications; transportation problems; decomposition techniques. Also offered as Mathematical Sciences 471.

Mr. Bixby

472a. Introduction to Game Theory (3-0-3).
Solution concepts for different games: strategic form game, coalition form game and extensive form game. Elementary application to economics and political science.

Mr. Chae

475a. Operations Research, Deterministic Models (3-0-3).
Optimization problems in a managerial and economic context. Familiarity with linear programing and microeconomic theory is strongly recommended. Also offered as Mathematical Sciences 475.

Staff

476b. Operations Research, Stochastic Models (3-0-3).
Decision theory, waiting line theory, Markov chains, inventory models, replacement models, simulation. Prerequisite: Mathematical Sciences 380 or 381. Also offered as Mathematical Sciences 476.

Mr. Pfeiffer

477. Mathematical Structure of Economic Theory I (3-0-3)
Competitive economics from a mathematical prespective, unifying calculus, matrix algebra, and set-theoretic approaches. Theories of household, firm; production models. Prerequisite: Economics 211, Mathematics 212, Mathematical Sciences 310. Also offered as Mathematical Sciences 477. Not offered every year.

Staff

478. Mathematical Structure of Economic Theory II (3-0-3)
Continuation of Economics 477, which is prerequisite. Also offered as Mathematical Sciences 478. Not offered every year.

Staff

483. Public Finance (3-0-3).
Tax and expenditure policies at the federal, state, and local levels; emphasizes resource allocation and equity and current tax reform issues. Prerequisite: Economics 211.

Mr. Zodrow

485a,486b. Contemporary Economic Issues (3-0-3 semester).
Analysis of urgent and significant economic problems. Emphasis on the evaluation of policy remedies. Principal topics vary from year to year.

Staff

495a,496b. Senior Seminar (3-0-3 semester).
Reading and discussion of topics in advanced economics. Open to seniors with special approval.
Staff

500a,b. Master's Thesis Research (Variable).
Research on an approved topic in partial fulfillment of the requirements for the master's degree.
Staff

501a. Microeconomic Theory I (3-6-5).
Theory of the firm, the theory of consumer behavior, duopoly, bilateral monopoly, imperfect competition, capital theory, and the theory of income distribution.
Mr. Brito

502a. Advanced Macroeconomic Theory (3-6-5).
Macroeconomic theory of output, consumption, investment, interest rates, inflation. and employment.
Mr. Hartley

504b. Advanced Economic Statistics (3-6-5).
Statistical inference and the testing of hypotheses multiple and partial correlation analysis; analysis of variance and regression.
Mr. Sickles

505b. Monetary Theory (3-6-5).
More detailed discussion of selective macroeconomic and monetary topics.
Mr. Bryant

506b. Topics in Macroeconomics (3-6-5).
Selected topics of current interest. The purpose of the course is to introduce students to active research issues and methods to the neoclassical school.
Mr. Hartley

507a. Mathematical Economics (4-0-5).
Theory of household, firm; activity analysis; set theory, matrix algebra, vector calculus, metric spaces, separation theory, constrained optimization.
Mr. Young

508b. Mathematical Economics II (4-0-5).
Continuation of Economics 507. Set theoretic approach to general equilibrium; aggregate linear and nonlinear production models; existence, stability, optimality.
Mr. Chae

510a. Econometrics I (3-6-5).
Estimation and inference in single equation regression models, multicollinearity, autocorrelated and heteroskedastic disturbances, distributed lags, asymptotic theory, and maximum likelihood techniques. Emphasis is placed on the ability to analyze critically the literature. Prerequisite: Economics 504.
Mr. Brown

511b. Econometrics II (3-6-5).
Topics in linear and nonlinear simultaneous equations estimation, including qualitative and categorical dependent variables models and duration analysis. Applied exercises use SAS and the Wharton Quarterly Econometric Model. Prerequisite: Economics 510.
Mr. Sickles

512. International Trade Theory (3-6-5).
Classical, neoclassical, and modern trade theory; some welfare aspects of trade, including the theory of commercial policy. Applications are emphasized.
Mr. Smith

514. Industrial Organizations and Control (3-6-5).
Industrial markets and public policy.
Staff

515. Labor Economics (3-6-5).
The economics of the labor market and the economic implication of trade unions. Attention is given to major public policy issues. Not offered every year.
Staff

516. Economic History and Development (3-6-5).
Historical analysis of economic growth and industrialization of the U.S., Western Europe, and Russia in the last 150 years. Stresses conditions which favored or retarded growth. Not offered every year.
Mr. Rimlinger

517. History of Economic Analysis (3-6-5).
The development of economic analysis from the scholastics to the neoclassical school.
Mr. Rimlinger

518. International Finance (3-6-5).
International monetary problems, foreign exchange theory, international investments.
Mr. Hartley

519. Economic Growth and Development (3-6-5).
Analysis of theory and policy questions relating to the level and rate of economic development.
Mr. Soligo

521. Public Finance I (3-6-5).
Theory of public goods and externalities, polilitical mechanisms and public choice, theory of local public goods, cost-benefit analysis and project evaluation issues of income redistribution.
Mr. Mieszkowski

522. Public Finance II (3-6-5).
Effects of taxation on individual and firm behavior, general equilibrium tax incidence analysis, optimal taxation theory, optimal implementation of tax reform, analysis of comprehensive income and consumption taxes.
Mr. Zodrow

523. Optimization and Capital Theory (3-6-5).
Dynamics, capital theory and intertemporal optimization.
Mr. Brito

530. Comparative Economic Systems (3-6-5).
Analysis of theoretical models of market and centrally planned economics; national economic systems of the Soviet Union, China, Yugoslavia, Western European countries, and the United States. Not offered every year.
Mr. Soligo

536b. Government Regulation of Industry (3-6-5).
Advanced analysis of the economics of antitrust and other forms of regulation. Not offered every year.
Staff

561. Urban Economics (3-6-5).
Analysis of urban development and such urban problems as housing, land use, transportation, discrimination, and pollution.
Mr. Mieszkowski

565. Health Economics (3-6-5).
Economic aspects of health; production, cost, demand and supply factors; methods of payment and effects of regulation.
Mr. Lairson, Mr. Swint

573. Nonlinear Programming (3-0-3).
Theory and computational methods for nonlinear programming, including: Kuhn-Tucker conditions, duality theory, methods for constrained optimization of convex and nonconvex problems. Also offered as Mathematical Sciences 573. Not offered every year.

Mr. Young

577. Topics in Economic Theory I (3-0-3).
Selected topics in advanced economic theory. Prerequisite: Economics 508. Not offered every year.

Mr. Chae

578. Topics in Economic Theory II (3-0-3).
Selected topics in advanced economic theory. Prerequisite: Economics 508. Not offered every year.

579. Topics in Economic Theory III (3-0-3).
Selected topics in advanced economic theory. Prerequisite: Economics 508. Not offered every year.

591a, 592b. Topics in Policy and Applied Economics (3-6-5 each semester).

Staff

593a. Workshop in Econometrics (3-0-3).
The course is designed to expose graduate students to advanced topics in applied and theoretical econometrics through guest lectures by leading researchers in the field. Students participating in the seminar are expected to prepare, over the course of the year, a research paper and present it in the workshop.

Mr. Brown

594b. Workshop in Econometrics (3-0-3).
The course is designed to expose graduate students to advanced topics in applied and theoretical econometrics through guest lectures by leading researchers in the field. Students participating in the seminar are expected to prepare, over the course of the year, a research paper and present it in the workshop.

Mr. Brown

595a. Readings in Advanced Topics (3-0-3).

Staff

596b. Readings in Advanced Topics (3-0-3).

Staff

800a,b,c. Graduate Research (Variable).

Staff

Education

Associate Professor L. McNeil, *Chair*
Associate Professor J.D. Austin, *Director of Student Teaching*
Lecturers Baum and Duke

Degrees Offered: Secondary Teaching Certificate in conjunction with B.A. in major field; Master of Arts in Teaching

Teacher Education and Certification. Rice University seeks to contribute graduates to society able to think and to question, educated to comprehend and to cope with a rapidly changing world. Although professional instruction is not the primary ingredient of undergraduate education, the University's role in preparing students for their future life work cannot be ignored. While maintaining complete institutional integrity, Rice University supports the intention as well as the letter of regulations promulgated by the state governing the development and presentation of teacher preparation and certification programs.

To this end, the Rice University Department of Education closely cooperates with departments offering work in subject matter fields. It is the function of this department to provide rigorous professional courses and to administer the established teacher education programs.

The Rice University teacher education program strives to fit the prospective teacher to perform all the roles which may be expected of a teacher. To accomplish this objective, it gives sustained close attention to the following vitally interrelated components:

1. A sound liberal or general education.
2. An extended knowledge of the subject(s) or area(s) to be taught.
3. Professional knowledge (i.e., relevant historical, philosophical, social, and psychological material).
4. Skills in managing a classroom, in working with children and adults, and in supervising the learning process.

Admission to the Teacher Education Program. Students who have satisfied the following requirements may apply to the Rice University Teacher Education Council for admission to the teacher education program:

1. Junior standing at Rice University.
2. A grade of "C" or better in all semester hours attempted in applicant's teaching field(s).
3. Evidence of satisfactory speech patterns.
4. Evidence of adequate physical vigor and strength, and absence of obvious physical conditions which might interfere materially with performance as a teacher in a classroom.
5. Approval of a completed Teacher Certification Program for by the appropriate departmental representatives and the Teacher Education Council prior to registration for the junior year.
6. Satisfactory scores on all preprofessional skills test.

Requirements for a Texas Provisional Teaching Certificate (Grades 7-12). Rice University is approved by the State of Texas to offer teacher preparation programs in the following fields: art, biology, chemistry, earth science, economics, English, French, German, health education, history, Latin, mathematics or mathematical sciences, physical education, physics, political science, psychology, Russian, general science, social studies, sociology, and Spanish.

After satisfactory completion of the Rice University teacher education program, the student will be recommended for a Texas teaching credential. The Texas Education Agency will then award the student a Texas Provisional Teaching Certificate, Grades 7-12.

The Rice University teacher preparatory program requires the following:

1. A bachelor's degree.
2. Foundations in Arts and Sciences (recommended to be completed during the freshman and sophomore years):
   English, 12 semester hours;
   American history, six semester hours,
   (History 211 and 212);

Government, 3 semester hours (Political Science 210); and
University distribution requirements.

3. Academic Specialization: (A student selects one of the following plans):
   - Plan I. Preparation to teach one field: At least 36 hours in field with at least 21 semester hours of advanced work. All courses must be approved by the Rice Teacher Education council.
   - Plan II. Preparation to teach two fields: At least 24 semester hours in each field with 12 semester hours of advanced work in each field. Courses must be approvedby the Rice Teacher Education Council.
   - Plan III. Preparation to teach related fields: At least 48 semester hours in a composite field (general science or social studies) with at least 18 semester hours of advanced work. Courses must be approved by the Rice Teacher Education Council.
4. Professional Education: 18 semester hours consisting of the following. Education 311, 312, 409, 3 semester hours in Seminar in Teaching (e.g., 304 and 404, 304 and 402, only 410, only 416), and 6 hours in student teaching (Principles of Teaching).

Supervised Teaching Experience. Either of two plans may be followed by teacher education candidates.

1. Apprenticeship Plan (Plan A):

Prerequisite: Education 304, 311, 312.

Apprenticeship is designed for students who wish to complete preparation for their teaching careers in four years and two six-week summer sessions. Candidates will enroll for the summer session following their junior year. The apprentice will assist and teach under the supervision of a master teacher and University faculty in the Rice Summer School for High School Students.

Education 409 and a 400-level course, Seminar in Teaching, is to be completed during the senior year.

Following graduation from Rice, the apprentice will again teach in the Rice Summer School for High School Students under the supervision of a master teacher and University faculty. The apprentice is not remunerated for teaching either summer. He or she is recommended for the Texas Provisional Teacher's Certificate following successful completion of the second summer and state Excet tests.

2. Internship Plan (Plan B):

Prerequisite: completion of all course work except student teaching.

Under this plan, students are expected to attend a six-week summer session immediately following their graduation from Rice. Each intern will observe and teach classes under the supervision of a master teacher and University faculty in the Rice Summer School for High School Students. During the following fall semester, interns will teach in a neighboring school system. Such placement will be subject to the availability of openings in the intern's teaching field(s).

The intern will be employed for full-time duty and will teach under the supervision of a member of the cooperating school system and a faculty member from the University. During the half year of service, the intern will be paid a salary commensurate with the salary being paid a full-time teacher with a degree and an emergency teaching permit by the cooperating school system. Upon successful completion of the internship semester and upon the recommendation of the secondary school principal, the intern will offered a regular teaching contract

for the spring semester if a suitable vacancy exists. He or she will be recommended for a Texas Provisional Teacher's Certificate after successful completion of state Excet tests.

Program for the Master of Arts in Teaching. Most candidates entering the program will have had no professional education courses. During the program, candidates usually fulfill all requirements for a Texas Provisional Teaching Certificate. The program consists of the following components:

1. Courses in secondary school educational theory, teaching strategies, educational objectives, and evaluation.
2. Graduate and upper division courses in the candidate's two subject matter teaching fields and/or related fields.
3. Supervised full-time teaching in the Rice Summer School for High School Students for two summers. Candidates will be responsible for the design and implementation of courses, for teaching, and for evaluation.
4. Supervised teaching internship for one semester in a cooperating public school system. (With the approval of the Department of Education a second semester internship may be substituted for the second summer of student teaching.)

Candidates with a valid secondary teaching certificate *may* be exempted from the professional education courses and the second summer of student teaching.

Normally, the degree program will consist of 11 semester courses. However, some candidates may need to remove deficiencies for certification and may therefore require additional courses.

Students in the program will not normally be eligible for Rice Graduate Fellowships or scholarship support since the cooperating school districts pay a salary for internship teaching. However, a limited number of tuition waivers is available.

Please refer to page 107 for additional information regarding admission to the graduate program in education.

Education Courses

304b. Seminar in Teaching (1-0-1).
A study of procedures and materials used in teaching various subject areas. Preparation of resource units, orientation to secondary school teaching. (Junior-level apprentice teachers only.) Prerequisite: Education 311.

Mr. Austin, Ms. McNeil, Mr. Baum, Mr. Duke

311a. The Historical and Philosophical Foundation of Education (3-0-3).
Analysis of contemporary and historical theories useful in planning educative activities of the secondary school. Prerequisites: Those intending to complete Rice education program: History 211, 212, 105, 106; or permission of instructor; and filing of Teacher Certification Plan.

Mr. Austin, Mr. Duke, Ms. McNeil

312b. Psychology of Human Learning (3-0-3).
Introduction to theoretical systems of human learning with emphasis on implications for secondary education; introductory tests and measurements.

Mr. Austin, Mr. Duke

400b. Seminar in Teaching (2-0-2).
(Apprentice English teachers only.) Prerequisites: Education 304, 409.

Ms. McNeil

402b. Seminar in Teaching (2-0-2).
(Apprentice social studies teachers only.) Prerequisites: Education 304, 409.

Mr. Baum

404b. Seminar in Teaching (2-0-2).
(Apprentice mathematics and science teachers only.) Prerequisites: Education 304, 409.
Mr. Austin, Mr. Duke

406b. Seminar in Teaching (2-0-2).
(Apprentice health and physical education teachers only.) Prerequisites: Education 304, 409.
Mr. Duke

407b. Seminar in Teaching (2-0-2).
(Apprentice art teachers only.) Prerequisites: Education 304, 409.
Mr. Baum

408b. Seminar in Teaching (2-0-2).
(Apprentice foreign language teachers only.) Prerequisites: Education 304, 409.
Ms. McNeil

409a. Fundamentals of Secondary Education (3-0-3).
Background, purposes, and organization of modern secondary education curriculum and current trends in administration of secondary schools. Introductory educational research.
Mr. Austin, Mr. Baum, Mr. Duke

410b. Seminar in Teaching (3-0-3).
(English teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisite: Education 311, 409.
Ms. McNeil

412b. Seminar in Teaching (3-0-3).
(Social studies teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisites: Education 311, 409.
Mr. Baum

414b. Seminar in Teaching (3-0-3).
(Mathematics and science teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisites: Education 311, 409.
Mr. Austin, Mr. Duke

416b. Seminar in Teaching (3-0-3).
(Health and physical education teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisites: Education 311, 409.
Mr. Duke

417b. Seminar in Teaching (3-0-3).
(Art teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisites: Education 311, 409.
Mr. Baum

418b. Seminar in Teaching (3-0-3).
(Foreign language teachers only.) Same as Education 304. Students with credit in Education 304 may not enroll. Prerequisites: Education 311, 409.
Mr. McNeil

419a,b. Principles of Teaching (3-0-3).
Introduction to teaching in the secondary school and supervised teaching.
Staff

491a,b. Independent Study and Research (3-0-3).
Enrollment by consent of instructor.
Mr. Austin, Ms. McNeil

519a,b. Principles of Teaching (3-0-3).
Introduction to teaching in the secondary school and supervised teaching.
Staff

590c. Contemporary Topics in Secondary School Mathematics (6-0-6).
Selected topics in secondary school mathematics. Offered in summers as needed. Enrollment by consent of instructor.

Mr. Austin

591a,b. Independent Study and Research (3-0-3).
Enrollment by consent of instructor.

Mr. Austin, Ms. McNeil

595c. Contemporary Topics in Secondary School Science and Mathematics (3-0-3).
Offered in summers as needed. Enrollment by consent of instructor.

Mr. Austin

Engineering and Applied Science

The George R. Brown School of Engineering

Rice's engineering programs have been prominent since the early days of the University. Seven departments, each of which is strong in teaching and research, now comprise the George R. Brown School of Engineering. The school was dedicated in 1975 at ceremonies honoring the distinguished Rice alumnus, trustee, and benefactor who was a founding partner in Brown & Root, Inc.

B.S. programs are accredited by the Accreditation Board for Engineering and Technology (ABET) in chemical engineering, civil engineering, electrical engineering, mechanical engineering, and materials science and engineering.

General Undergraduate Information. Curricula in engineering at Rice University lead to either Bachelor of Arts or Bachelor of Science degrees in the fields of chemical engineering, civil engineering, electrical and computer engineering, mechanical engineering, and in materials science and engineering. In computer science and in mathematical sciences, curricula lead to the Bachelor of Arts degree. These curricula may also be used as part of integrated five-year programs that lead to professional master's degrees in each of the above fields and in environmental science or environmental engineering.

A student taking the B.A. program is required to pass a total of at least 120 semester hours (40 courses). The major department may require no more than 80 specific semester hours for the major and may require fewer. Students must complete at least 60 semester hours in addition to the departmental major requirements. Some departments require more than 120 hours for graduation.

A student following a B.S. program in engineering (other than chemical engineering) must pass a total of at least 134 semester hours (137 semester hours for chemical engineering). Except for chemical engineering, which may require up to 104 semester hours in specific course requirements, no department may require more than 92 semester hours in specific courses for the B.S. degree.

Each student should get a list of required courses from the appropriate department. First- and second-year students should have their programs approved each semester by an engineering adviser as well as by their college adviser. Before registering for the junior year, students must associate themselves with an adviser in the department of their major and have the choice of major approved. Registration for every semester thereafter must be approved by an adviser in the major department.

The undergraduate courses listed below are offered for the preparation of students majoring in all branches of engineering.

Engineering Courses

200b. Classical Thermodynamics (3-0-3).
Fundamental exposition of the laws of classical thermodynamics and deductions therefrom. Applications illustrated with particular attention to pure substances. Prerequisite: Physics 101, 102.
Mr. Chapman

211a. Engineering Mechanics (3-0-3).
Equilibrium of static systems, dynamics of a particle, dynamics of particle systems, and rigid-body dynamics. Elements of vibrational analysis. Prerequisite: Physics 101, 102, Mathematics 101, 102.
Mr. Wierum

241a,b. Electrical Circuits (3-3-4).
Basic circuit elements, mesh and node analysis, Thevenin and Norton equivalent circuits, controlled sources and op-amps solution of circuits, differential equations, use of phasors and impedance for sinusoidal AC analaysis, frequency response. Laboratory on basic electrical measurements. Prerequisite: Mathematics 101, 102 or equivalent.
Mr. Leeds

Chemical Engineering

The George R. Brown School of Engineering

Professor L. V. McIntire, *Chair*
Professors Akers, Armeniades, Davis, Dyson, Hellums, Hightower, Kobayashi, and C. A. Miller
Adjunct Professor G. D. Fisher
Associate Professor Zygourakis
Adjunct Associate Professor W. House
Assistant Professors Glacken, Pegg, Robert, and San
Adjunct Assistant Professor L. C. Moorhead
Lecturer Hirasaki

Degrees Offered: B.A., B.S., M.Ch.E., M.S., Ph.D.

Undergraduate Program. The undergraduate curriculum in chemical engineering is designed to provide a sound scientific and technical basis for further professional development. Concurrently, the student has the opportunity to concentrate on a particular technical specialty such as applied mathematics, biomedical engineering, biotechnology, environmental quality, kinetics and catalysis, engineering economics, petroleum production, solid state materials, or polymer science and engineering.

In the four-year curriculum, a student may qualify for either the Bachelor of Arts degree or the Bachelor of Science degree. The Bachelor of Arts program is highly flexible and allows a student to pursue other areas of interest with or without a double major. The Bachelor of Science program has a higher content of required scientific and professional courses. On completion of either bachelor's program, a student is eligible to apply for a fifth year of specialized study leading to the degree of Master of Chemical Engineering. The curriculum is designed so that outstanding students interested in careers in research and teaching may enter graduate school after either bachelor's degree.

The Department of Chemical Engineering requires 78 semester hours in the major for the B.A. degree, prerequisites and laboratory courses included. In addition to these requirements, students must also satisfy the distribution requirements and complete no fewer than 59 semester hours outside the departmental requirements for a total of at least 137 semester hours.

The B.S. degree is accredited by the Accreditation Board for Engineering and Technology. Students enrolled in the B.S. program must take:

Chemistry 101, 102, 107, 211, 212, 213, 214, 311, 312, 313;
Chemical Engineering 301, 302, 344, 370, 390, 401, 402, 403, 404, 411, 412, 443, 444;
Mathematics 101, 102, 211, 212 or equivalent honors courses;
Mathematical Sciences 340 or 381;
Physics 101, 102, and 132;
Computing requirements: four hours of Mathematical Sciences 223 or one hour of Mathematical Sciences in APL and Computer Science 220 or Engineering 211;
An approved basic science course;
Two courses selected from Engineering 241, Materials Science 301, and Civil Engineering 300.

In addition to these courses, students must satisfy the distribution requirements and complete sufficient courses outside the departmental requirements for a total of at least 137 semester hours. A specific B.A. option in biochemical engineering is available.

Graduate Program. Graduate study in chemical engineering can lead to the Master of Chemical Engineering, the Master of Science, or the Doctor of Philosophy. University requirements for the professional degree M.Ch.E. are given on page 108. The Department requires that at least six of the courses taken must be at the advanced level in chemical engineering. In addition, four semesters of chemical engineering design, a computer science course, and an approved mathematics course must have been taken some time in the student's curriculum. Suggested course combinations are available with emphasis in the areas of biochemical engineering, petroleum engineering, and electronics materials.

University requirements for the research degrees M.S. and Ph.D. are outlined on pages 105-106.

Candidates for the Master of Science degree are required to complete a minimum of 18 approved semester hours with high standing. They must also submit an original research thesis and defend it in a public oral examination.

Candidates for the Doctor of Philosophy degree must demonstrate competence in the areas of applied mathematics, thermodynamics, transport processes, and chemical kinetics and reactor design by passing qualifying examinations, normally during the first year of study. They must also complete a minimum of 36 approved semester hours with high standing and submit a thesis that provides evidence of their ability to carry out original research in a specialized area of chemical engineering. With departmental approval, the course requirements may be reduced to 24 hours for students already having an M.S. degree. The thesis must be defended in a public oral examination.

Prerequisites for Undergraduate Chemical Engineering Courses

Course	*Prerequisites*
Ceng 301	Math 101,102; Chem 101, 102; 1 hour credit in Comp 223 (APL)
Ceng 302	Ceng 301; Comp 223 (or 1 hour credit — APL — in Comp 223 plus Engi 240); co-requisite Math 212
Ceng 370	Ceng 403
Ceng 390	Ceng 301; Chem 311; Math 211
Ceng 401	Phys 101, 102; Math 211, 212; Ceng 302; Chem 311
Ceng 402	Phys 101, 102; Math 211, 212; Ceng 302; Chem 311
Ceng 403	Phys 101, 102; Math 211, 212; Engi 211; Ceng 302

Ceng 404	Ceng 370, 390, 401, and 411
Ceng 411	Math 381 or Masc 340; Ceng 401
Ceng 412	Ceng 411

Note: With the *written* consent of the instructor, a student may register for a course without having completed the required prerequisite(s), but such consent can be expected only in unusual circumstances and will not carry forward. For example, if the instructor for Chemical Engineering 411 waives Chemistry 311 for a person, then the person upon completing Chemical Engineering 411 may not proceed to Chemical Engineering 412 without the consent of that instructor since Chemistry 311 is an implied prerequisite for Chemical Engineering 412.

Chemical Engineering

Chemical Engineering Courses

301a. Chemical Engineering Fundamentals (3-0-3).
Use of basic mathematical concepts, physical laws, stoichiometry, and the thermodynamic properties of matter to obtain material and energy balances for steady and unsteady state systems. Required for sophomores intending to major in chemical engineering.

Mr. Davis

302b. Separation Processes (3-0-3).
Systematic treatment of single and multistage contacting operations involving binary and multicomponent systems. Prerequisite: Chemical Engineering 301.

Mr. Dyson

344b. Chemical Engineering Laboratory (1-3-2).
Experiments demonstrating the principles presented in Chemical Engineering 301, 302, 390.

Mr. Hightower

370b. Process Dynamics and Control (3-0-3).
Fundamentals of complex variables. Modeling of dynamic processes. Response of uncontrolled systems. Transfer functions. Feedback controllers. Response and stability of controlled systems. Frequency response and Nyquist Stability Criterion. Design of feedback controllers. Cascade feedforward and multivariable control systems. Introduction to digital computer control. Students will use simulators for designating feedback controllers and experiment with a laboratory computer control system.

Mr. San, Mr. Zygourakis

390b. Kinetics and Reactor Design (3-0-3).
Principles and significance of chemical kinetics; procedures for evaluating kinetic parameters from reaction rate data; application of these methods to design and predict the performance of various types of ideal and nonideal chemical reactors in both homogeneous and heterogeneous systems.

Mr. Hightower

401a. Introduction to Transport Phenomena (3-0-3).
Fundamental principles of heat, mass, and momentum transport applied to the continuum; analysis of macroscopic physical systems based on the continuum equations. Prerequisite: Chemical Engineering 302 or permission of instructor.

Mr. McIntire

402b. Introduction to Transport Phenomena (3-0-3).
Continuation of Chemical Engineering 401.

Mr. Hellums

403a. Equipment Design I (3-3-4).
Applications of the basic principles of fluid mechanics and thermodynamics to the design and performance of process equipment. Introduction to process control.
Mr. Glacken

404b. Equipment Design II (3-3-4).
Optimal design of chemical reactors and heat exchange equipment; industrial economic principles. Special process design projects in small groups.
Mr. Armeniades

411a. Fundamentals of Thermodynamics (3-0-3).
Development and application of the first and second laws of thermodynamics.
Mr. Miller

412b. Thermodynamics II (3-0-3).
Advanced treatment of chemical and physical equilibrium in multicomponent systems. Detailed study of nonideal solutions.
Mr. Robert

443a. Chemical Engineering Laboratory (1-3-2).
Experiments demonstrating transport coefficient measurement, forced and free convection transfer operations, and thermodynamic principles as covered in Chemical Engineering 401, 402, 411.
Mr. Dyson

444b. Chemical Engineering Laboratory (1-3-2).
Same as Chemical Engineering 443.
Mr. Dyson

483a. Undergraduate Research (Variable).
Independent investigation of a specific topic or problem in modern chemical engineering research under the direction of a selected faculty member. Prerequisite: permission of the department.
Mr. Hightower

484b. Undergraduate Research (Variable).
Same as Chemical Engineering 483.
Mr. Hightower

501a. Fluid Mechanics and Transport Processes (3-0-3).
Advanced study in fluid mechanics and transport processes including analytical and numerical approximation methods, boundary layer theory, and hydrodynamic stability.
Mr. Hellums

503a. Chemical Engineering Processes I (2-3-3).
Synthesis course applying the principles of staged processes, transport phenomena, kinetics, and economics to te simulation, design, and operation of equipment and processes.
Mr. Akers

504b. Chemical Engineering Processes II (2-3-3).
Continuation of Chemical Engineering 503, with emphasis on the use of available process design computer programs.
Mr. Kobayashi

540b. Statistical Thermodynamics (3-0-3).
A development of the equilibrium theory of statistical mechanics. Applications to imperfect gas theory and the calculation of thermodynamic properties of matter. Prerequisite: Chemistry 311, 312, 430; Mathematics 211, 212; Physics 201, 202 or 211, 212. Also offered as Chem 420.
Mr. Robert

571a. Reservoir Engineering (3-0-3).
Basic reservoir engineering principles-single and two phase flow in porous media.
Mr. Miller

580b. Biochemical Reactors (3-0-3).
Description, analysis, and design of biochemical reactors. Interplay of heat and mass transfer with biochemical kinetics in biochemical reactors. Fermentation, enzyme, and tissue culture reactors. Prerequisite: Biochemistry 361, 501 or 471 and Chemical Engineering 390 or equivalent.
Mr. San, Mr. Glacken

591a. Heterogeneous Catalysis (3-0-3).
Principles of heterogeneous catalyst, catalyst preparation, measurement and significance of surface physical and chemical properties, absorption, heterogeneous kinetics, diffusion in porous media, catalyst poisoning and regeneration, aspects of reactor engineering, and a review of selected commercial catalytic reactions.
Mr. Hightower

593a. Polymer Science & Engineering (3-0-3).
Basic concepts in macromolecular chemistry and their application in the synthesis and chemical modification of polymers. Prerequisite: Chemistry 211, 212.
Mr. Armeniades

594b. Properties of Polymers (3-0-3).
Molecular organization and physical properties of polymneric materials; elastomeric, semicrystalline, and glassy polymers; processing and technology of polymeric systems. Also offered as Material Sciences 594.
Mr. Armeniades

601b. Fluid Mechanics and Transport (3-0-3).
Advanced study in one of several areas of fluid mechanics or transport, including tensor analysis, continuum mechanics, rheology, and mathematical methods of special interest in fluid mechanics.
Mr. McIntire

602b. Physico-Chemical Hydrodynamics (3-0-3).
Topics in hydrodynamics including areas such as waves on liquid surfaces, conventive diffusion in liquids, motion of drops and bubbles, and electrophoresis.
Mr. McIntire

611a. Advanced Topics in Thermodynamics (3-0-3).
An advanced treatment of the classical thermodynamics of pure and multicomponent systems. Topics include first and second law analysis of engineering problems, property estimation and prediction, mixture theories, phase and chemical equilibria, and availability analysis.
Mr. Robert

661a. Graduate Seminar (1-0-1).
Mr. Davis

662b. Graduate Seminar (1-0-1).
Mr. Miller

671b. Reservoir Engineering II (3-0-3).
Computational methods in reservoir engineering; application to reserves estimation, recovery prediction, history matching, tertiary recovery operations.
Mr. Hirasaki

672a. Applied Mathematics I (3-0-3).
.Linear algebra and its applications; direct and iterative methods for the solution of linear systems of equations, eigenvalues and eigenvectors, systems of ordinary differential equations, quadratic forms, series solution of ordinary differential equations and special functions and applications to chemical engineering problems.
Mr. Zygourakis

673b. Applied Mathematics II (3-0-3).
Linear operator theory, Green's functions, integral equations, perturbation and numerical methods, and functional analysis used in the solution of chemical engineering problems. Prerequisite: Chemical Engineering 672 or permission of instructor.

Mr. Davis

675a. Process Dynamics (3-0-3).
Dynamic equations for discrete and continuous models of chemical systems; lumped parameter systems and state space representation and multivariable control techniques; nonlinear systems, linearization, and phase plane analysis; sampled data systems; digital simulation techniques.

Mr. San

683a. Master's Research and Thesis (Variable).

Mr. McIntire

684b. Master's Research and Thesis (Variable).

Mr. McIntire

692b. Chemical Reaction Engineering (3-0-3).
Modeling of stirred tank and tubular reactors. Multiplicity and stability of steady states. Nonideal flow patterns and models. Diffusuin and reaction in porous catalyst pellets. Catalyst deactivation. Fluid-solid noncatalytic reactions. Design of fixed bed cataytic reactors. Fluidized bed reactors. Material from current literature.

Mr. Zygourakis

730a. Advanced Topics (3-0-3).
Biomechanics and biomaterials; structure and function of extracellular supportive tissue in skeletal and cardiovascular systems; design, development, and evaluation of synthetic polymers for structural tissue replacement.

Mr. Armeniades

800b. Graduate Research (Variable).

Mr. McIntire

Civil Engineering

The George R. Brown School of Engineering

Professor Lutes, *Chair*
Professors Holt, Merwin, Spanos, and Veletsos
Associate Professor Durrani
Assistant Professor Dakoulas
Lecturers Gosain, Loutzenheiser, and Haris

Degrees Offered: B.A., B.S.C.E., M.C.E., M.S., Ph.D.

Preceptors

Walter P. Moore, Jr.
Walter P. Moore & Associates
Houston, Texas

Charles Culver
National Bureau of Standards
Washington, D.C.

William J. LeMessurier
LeMessurier Associates/SCI
Cambridge, Massachusetts

The profession of civil engineering is concerned with the development, planning, design, construction, and operation of large facilities and systems. These include buildings, bridges, and other structures of various forms; transportation systems, water supply systems, drainage and flood control and systems for waste disposal and pollution control. The planning of new communities and the redevelopment of existing cities are also within the spectrum of civil engineering activities.

Undergraduate Program. The professional degree is the Bachelor of Science in Civil Engineering. The programs leading to this degree are accredited by the Accreditation Board for Engineering and Technology. The student may choose to take a quite general basic program, or one of two somewhat more specialized options: the Environmental Engineering Option (offered in conjunction with the Department of Environmental Science and Engineering) or the Structural Engineering Option. This latter option includes at least three graduate level courses, and it is intended only for students who have demonstrated the potential to do work at that level. The departmental requirements are as follows:

Basic Program
Mathematics 101, 102, 211, 212, and Mathematical Sciences 223 and 381 or 382
Physics 101, 102, 132, Chemistry 101, 102
One of the following: Chemistry 211, Geology 101, 102, Environmental Engineering 201, 443, Physics 201, Biology 122
Two of the following: Engineering 200, 241, Materials Science 301, Geology 352
Engineering 211, Environmental Engineering 403
Civil Engineering 251, 300, 302, 304, 305, 306, 363, 365, 403, 404, 451, 464, 470
One of the following: Civil Engineering 530, 532, 540, 570
One of the following: Civil Engineering 511, 512, 530, 532, 540, 570

Environmental Engineering Option
Mathematics 101, 102, 211, 212, and Mathematical Sciences 223 and 381 or 382
Physics 101, 102, 132, Biology 122, Chemistry 101, 102, 107, 211, 213
Engineering 211, Environmental Engineering 201, 412, 401, 403
Civil Engineering 300, 302, 304, 306, 363, 365, 403, 404, 470
Two of the following: Environmental Engineering 517, 518, 536, 550
One of the following: Geology 341, 352, Environmental Engineering 443
Chemistry 212 and 214, 311

Structural Engineering Option
Mathematics 101, 102, 211, 212, Mathematical Sciences 223 and 381 or 382
Physics 101, 102, 132, Chemistry 101, 102
One of the following: Chemistry 211, Geology 101, 102, Environmental Engineering 201, 443, Physics 201, Biology 122
Two of the following: Engineering 200, 241, Materials Science 301, Geology 352
Engineering 211
One of the following: Environmental Engineering 403, 412
Civil Engineering 300, 302, 304, 305, 306, 363, 365, 403, 404, 470, 500, 521
One of the following: Civil Engineering 530, 532, 540, 570
One of the following: Civil Engineering 511, 512, 530, 532, 540, 570
One of the following: Civil Engineering 503, 508, 515, 526, 531

In addition to the departmental requirements above, students must satisfy the University distribution requirements (page 55-56), and must complete a total program of at least 134 semester hours. More information on the civil engineering program, including a recommended course of study by semesters and suggestions for selecting electives, may be

obtained from the departmental office. The program of each student is formulated in consultation with a departmental adviser. As soon as students decide on an engineering major, they should consult the departmental advisers.

A Bachelor of Arts degree with a civil engineering major is also available for students not interested in a professional career in civil engineering. The B.A. program has less technical content than the B.S.C.E. program and hence more flexibility with electives. It is not accredited as a professional engineering curriculum. The detailed curriculum may be obtained from the departmental office. This curriculum requires at least 124 semester hours of which no fewer than 60 must be outside of the specific departmental requirements.

The Bachelor of Science in Civil Engineering is a suitable terminal degree for students interested in a professional career, but a master's degree is highly desirable. The Doctor of Philosophy degree is generally required for a career in teaching or in research and development.

Preceptorship Program. A limited number of preceptorships are available on a competitive basis for civil engineering majors. After completing the requirements for a Bachelor of Science in Civil Engineering, a student works for one year in the office of and under the personal guidance of a structural engineer who has achieved national or international prominence in the profession. The student then returns to Rice for a year of graduate study. The program is designed to provide the student with an opportunity to experience the professional practice of engineering at its highest contemporary level.

Graduate Program. Programs of study in structural engineering and structural mechanics can lead to the degrees of Master of Civil Engineering, Master of Science, and Doctor of Philosophy. Special attention is given to developing the student's interest in and ability for independent study and research in the M.S. and Ph.D. degree programs.

Applicants for graduate study are generally required to have a Bachelor of Science in Civil Engineering, with a significant emphasis on structural engineering. Consideration may be given to applicants with some other undergraduate degrees if they have adequate preparation in mathematics, mechanics, and structural analysis and design. Curricula such as engineering technology or construction technology do not represent adequate preparation.

The requirements for a professional Master of Civil Engineering degree are described on page 108. University requirements for other advanced degrees are described on pages 106-113. Departmental requirements for the M.S. and Ph.D. degrees are as follows. A candidate for the Master of Science degree is required to (1) complete at least 21 semester hours of approved courses; (2) complete an acceptable thesis; and (3) pass a final oral examination on the thesis. A candidate for the degree of Doctor of Philosophy must satisfy the following requirements: (1) complete at least 48 semester hours of approved courses with high standing; (2) pass a comprehensive preliminary examination designed to test the candidate's knowledge of the field and ability to think in a creative manner; (3) pass an oral qualifying examination on the proposed thesis research and related topics; (4) complete a thesis which shall constitute an original contribution to knowledge; and (5) pass a final public oral examination on the thesis and related topics. If the departmental faculty concludes at any stage of a student's doctoral program that he or she is unqualified to continue, the student is denied further registration.

The research interests of the members of the civil engineering faculty lie in the areas of structural and foundation dynamics, including earthquake engineering and offshore structures, applications of probability theory to civil engineering problems, particularly random vibrations and structural fatigue; behavior of concrete components and structural systems; experimental studies of fatigue in steel structural assemblies; and mechanical properties of soils.

M.S. and Ph.D. students are expected to participate in the instructional activites of the Department as part of their educational experience. This service will not usually be

required for more than one semester of an M.S. program or two semesters of a Ph.D. program, nor for more than ten hours per week in any semester.

Civil Engineering Courses

251a. Plane Surveying (2-3-3).
Fundamental surveying principles and techniques.

300b. Mechanics of Solids (3-0-3).
Stresses and deformations due to various loads. Study of engineering properties of materials and failure theories. Prerequisite: Engineering 211.

Mr. Merwin

302b. Strength of Materials Laboratory (0-3-1).
Standard tension, compression, and torsion tests of ferrous and nonferrous metals; experimental techniques, behavior of structural elements. Enrollment limited, preference given to Civil Engineering majors.

Mr. Merwin

304b. Structural Analysis I (3-0-3).
Analysis of statically determinate structures; stability and determinacy; influence lines and moving loads. Calculation of deflections. Introduction to analysis of indeterminate structures. Prerequisite: Engineering 211 and concurrent registration in Civil Engineering 300.

Mr. Lutes

305a. Structural Analysis II (3-0-3).
Force and displacement methods of analysis of indeterminate structures; influence lines; energy methods. Limit analysis of beams and frames. Prerequisite: Civil Engineering 304.

Mr. Holt

306b. Steel Design (3-0-3).
Design of steel members, connections, and assemblies. Behavior of steel members as related to design. Prerequisite: Civil Engineering 304.

Mr. Holt

341a. Applications of Personal Computers to Civil Engineering Problems (2-3-3).
Topics covered include graphical presentation of data; curve fitting; eigenvalue problems; linear optimization; and two dimensional structural analysis. Prerequisite: Civil Engineering 300, knowledge of computer programming. Permission of instructor required. Enrollment limited.

Mr. Merwin

363a. Applied Fluid Mechanics (3-0-3).
Fluid properties, fluid statics and incompressible fluid steady flow. Energy and momentum equations with many applications. Similitude and dimensional analysis. Viscous fluid flow in pipes and pipe networks.

365a. Hydraulics Laboratory (0-3-1).
Laminar and turbulent flow through pipes and fittings; open channel flow and hydraulic machinery.

Mr. Merwin

403b. Reinforced Concrete Design (3-0-3).
Material properties, flexural strength of rectangular and T-sections; strength design of beams, one-way slabs and footings; shear strength; deflections; and column design. Use of handbooks and computer programs for design. Prerequisite: Civil Engineering 304.

Mr. Durrani

404b. Concrete Laboratory (0-3-1).
Tests of materials and reinforced concrete members. Prerequisite: Civil Engineering 403 (concurrent).

Mr. Durrani

406a. Measurement and Control (3-3-4).
Also offered as Mechanical Engineering 406.

Mr. Bourland

451b. Introduction to Transportation (3-0-3).
Operational characteristics of transport modes, elements of transportation planning, and design of stationary elements.

Mr. Loutzenheiser

464b. Hydrology and Watershed Analysis (3-3-4).
Fundamentals of the hydrologic cycle, hydrography techniques, flood routing, and open channel flow; local watershed application and laboratory. Also offered as Environmental Science and Engineering 412.

Mr. Bedient

470a. Basic Soil Mechanics (3-3-4).
Soil exploration, soil properties and behavior, soil classifications, hydraulics of soil moisture, consolidation and settlement, strength characteristics, soil stabilization, lateral earth pressure, slope stability, and retaining wall design.

Mr. Dakoulas

495. Design of Civil Engineering Systems (3-0-3).
The material covered in previous civil engineering courses is integrated along with economic and financial consideration into the synthesis of civil engineering systems. Offered irregularly.

499a,b. Special Problems (Variable).
Study of selected topics including individual investigations, special lectures, and seminars. Offered upon mutual agreement of faculty and student.

Mr. Lutes

500a. Advanced Mechanics of Solids (3-0-3).
Advanced topics in stress analysis, curved beams, beams on elastic supports, plates, torsion of noncircular sections, columns, buckling, plate analysis. Enrollment normally limited to seniors and first-year graduate students.

Mr. Merwin

501a. Preceptorship Program (0-0-0).
Student completes 9 to 15 months of full-time internship in a selected professional office under the guidance of an appointed preceptor.

Mr. Lutes

502b. Preceptorship Program (0-0-0).
See Civil Engineering 501.

Mr. Lutes

503b. Structural Analysis by Matrix Methods (3-0-3).
Flexibility and stiffness of structural elements. Compatibility and equilibrium. Force and displacement methods of analysis. Finite element methods. Nonlinear structures. Prerequisite: Civil Engineering 305 or equivalent.

Mr. Holt

506a. Experimental Methods (3-3-4).
See Mechanical Engineering 406.

Mr. Bourland

507. Numerical Methods of Structural Analysis (3-0-3).
Numerical analysis of beams, beam-columns, and beams on elastic foundations, influence lines, buckling loads; natural frequencies. Foundation and solution of eigen value problems. Offered irregularly.

508a. Engineering Analysis (3-0-3).
Numerical integration of initial value problems. Energy methods, variational calculus. Finite difference, discrete element, and series methods for continuous boundary value problems. Applications in structural mechanics.

Mr. Veletsos

509. Analysis of Offshore Structures (3-0-3).
See Mechanical Engineering 509.

Mr. Spanos

511. Optimality in Design (3-0-3).
Application of optimization techniques to design and operation of civil engineering systems. Topics include problem formulation, linear and nonlinear optimization, and scheduling problems. Offered irregularly.

512a. Applications of Probability (3-0-3).
Probability, statistics, and decision theory applied to problems of design and operation of civil engineering systems. Prerequisite: Mathematical Sciences 381 or 382.

Mr. Lutes

514a. Theoretical Plasticity (3-0-3).
See Mechanical Engineering 514.

Mr. Cheatham

515b. Structural Plasticity, Fatigue, and Fracture(3-0-3).
Problems in limit analysis and design, plastic behavior of structures, fatigue failure and brittle fracture of structural components. Also offered as Mechanical Engineering 515.

Mr. Merwin

516b. Plates (3-0-3).
Introduction to theories of plates with applications to practical problems.

519. Shells (3-0-3).
Introduction to theories of shells with applications to practical problems. Offered irregularly.

Mr. Veletsos

521a. Structural Dynamics I (3-0-3).
Dynamics of force-excited discrete linear systems with applications to design. Prerequisite: permission of instructor for undergraduates not in Structural Option Program.

Mr. Veletsos

522b. Structural Dynamics II (3-0-3).
Dynamics of force-excited continuous linear systems and ground-excited linear and yielding structures. Fundamentals of earthquake engineering. Prerequisite: Civil Engineering 521.

Mr. Veletsos

523b. Probabilistic Structural Dynamics (3-0-3).
Dynamic response of structural systems to excitations characterized as stochastic processes. Prerequisite: Civil Engineering 521 or Mechanical Engineering 412 and basic knowledge of probability theory. Also offered as Mechanical Engineering 523.

Mr. Lutes

524b. Nonlinear Vibrations (3-0-3).
See description for Mechanical Engineering 524.

Mr. Spanos, Mr. Lutes

525b. Structural Dynamics III (3-0-3).
Special topics in structural dynamics, including problems of wave propagation, response of structures to waves, dynamics of foundations, soil-structure and fluid-structure interaction. Offered irregularly. Prerequisite: Civil Engineering 521.

Mr. Veletsos

526. Structural Stability (3-0-3).
Stability criteria. Flexural and torsional buckling of columns and frames, lateral buckling of beams, plate buckling. Effect of imperfections on strength. Beam-columns. Evaluation of design code provisions. Offered irregulary.

530a. Concrete Building Design (3-0-3).
Design of reinforced concrete building structures and floor slab systems. Case histories will be discussed. Prerequisite: Civil Engineering 403.
Mr. Gosain

531a. Behavior of Reinforced Concrete Members (3-0-3).
Moment-curvature relationship for beams and columns, biaxally loaded columns, slenderness effects, interaction diagrams, shear and torsion in members, shear wall-frame interaction, behavior under large load reversals; extensive use of microcomputers. Prerequisite: Civil Engineering 403.
Mr. Durrani

532b. Prestressed Concrete (3-0-3).
Prestressing techniques, prestress losses, deflections, shear and torsion, analysis and design of members using microcomputers, composite members, continuous beams and prestressed slabs. Prerequisite: Civil Engineering 403.
Mr. Durrani

540b. High-Rise Building Design (3-0-3).
Practical considerations from the conceptual stage to the final analysis; including design parameters and serviceability limitations. Prerequisite: Civil Engineering 305, 306, 403.
Mr. Haris

570b. Foundation Engineering (3-0-3).
Geotechnical engineering applications to the analysis, design, and construction of shallow and deep foundations and earth retaining structures. Prerequisite: Civil Engineering 470.
Mr. Dakoulas

699a,b. Special Problems (Variable).
Study of selected topics including individual investigations under the direction of a member of the civil engineering faculty. Offered upon mutual agreement of faculty and student.
Mr. Lutes

800a,b. Research and Thesis (Variable).
Mr. Lutes

Computer Science

Professor Kennedy, *Chair*
Professor Cartwright
Adjunct Professor Gorry
Assistant Professors Almes, Boehm, Felleisen, Golson, Hood, Krentel, Pollock, J. Warren, and Zwaenepoel
Adjunct Assistant Professor S. Warren
Research Scientists Callahan, Cooper, and Torczon
Lecturers Pearlman and Raulston

Degrees Offered: B.A., M.C.S., M.S., and Ph.D.

Undergraduate Program. During the first two years, all computer science majors are required to take the following courses:
Mathematics 101, 102 (or 121, 122)
Physics 101
Computer Science 211, 212, 280, 320

In addition, the following courses are strongly recommended:
Mathematics 211, 212
Physics 102, 132

During the spring semester of the sophomore year, prospective majors should apply for admission into the program. Because enrollment in the major is limited to the number of students that the facilities can handle, some applications may be turned down. After admission, a student will plan a course of study for the junior and senior years with a departmental undergraduate adviser. To complete the major, a student must fulfill the following requirements:

Software engineering: Computer Science 310
Algorithms: Computer Science 382
Linear algebra: Mathematical Sciences 310 or Mathematics 355
Probability/Statistics: Mathematical Sciences 381 or 382
Software systems: Computer Science 412 or 421
Hardware and architecture: Electrical and Computer Engineering 326 or 425
Computational mathematics: one of Mathematical Sciences 353, 451, 452, 453, 454, 471
Mathematics: one of 212, 312, 356, 425, or 463

plus two of the following courses not used to satisfy the above requirements:

Computer Science 340, 411, 412, 421, 425, 440, 480, 481

The courses required for the major sum to between 60 and 63 hours. Since the University requires 60 hours in addition to those used for the major, as many as 123 hours may be needed to graduate.

Undergraduate Honors Program. A student can, with the permission of the department, join the undergraduate honors program in Computer Science. The requirements for the freshman and sophomore years of the program are identical to the first two years in the standard program above. In order to complete the requirements for the major, a student must take the following courses:
Software engineering: Computer Science 310
Algorithms: Computer 382
Linear algebra: Mathematical Sciences 310 or Mathematics 355
Probability/Statistics: Mathematical Sciences 381 or 382
Software systems: Computer Science 412 and 421
Formal languages: Computer Science 481
Hardware systems: Electrical and Computer Engineering 425
Computational mathematics: one of Mathematical Sciences 451, 452, 453, 454, 471
Mathematics: 425 or 463
plus one of
Computer Science 340, 411, 480, 492

For more information about the program, please contact the departmental secretary.

Graduate Program. The department offers three graduate programs, the professional master's, the research master's and the doctoral. The professional program, a terminal degree program for students intending to pursue a technical career in the computer industry, awards the Master of Computer Science degree. To earn the degree, the student must successfully complete thirty semester hours of coursework approved by the department. A

minimum grade point average must be achieved over all courses counting toward the degree. The professional master's program normally requires three to four semester of study.

The research master's program requires a thesis in addition to coursework and culminates in the Master of Science degree. Admission to this program, however, is reserved for special situations.

The doctoral program, offered to students planning to pursue a career in computer science research and education, awards the degree of Doctor of Philosphy. To earn this degree, the student must pass a comprehensive examination covering the core areas of computer science, pass a qualifying examination in an area of specialization, conduct original research, submit an acceptable thesis proposal, successfully defend the thesis proposal, submit an acceptable thesis reporting research results, and pass a final oral defense. Upon successful completion of the comprehensive examination, the qualifying examination and the proposal defense, the student will be awarded the Master of Science degree. After a successful thesis defense and the completion of all departmental and university requirements, the student will be awarded the Doctor of Philosophy degree. The doctoral program normally requires four to five years of study.

Fellowships and research assistantships are available to students in the doctoral program. Both provide a monthly stipend for the academic year and cover all tuition expenses. More substantial monthly stipends may be available during the summer for students working on departmental research projects. In all cases, continued support is contingent on satisfactory progress in the program. During the academic year, students in the doctoral program assist the department in the teaching and administration of undergraduate and graduate courses. However, such duties will not be required of any student for more than four semesters and will not exceed an average of ten hours per week.

Current research interests of the faculty include algorithms, compiler construction, distributed systems, geometric modeling and robotics, parallel processing, performance evaluation, programming environments, programming languages, program verification, semantics, symbolic computation, and the theory of computation.

For further information and application materials, write the Department of Computer Science, Rice University, Post Office Box 1892, Houston, Texas 77251-1892.

Computer Science Courses

Note that course registrations at the 300 and 400 level may be restricted. In addition, course registrations at the 500 level and above require the permission of the instructor.

200. Elements of Computer Science (3-0-3).
A broad introduction to the major topics of computer science, including algorithms, mathematical models of computation, machine organization and design, programming languages, communication, and artificial intelligence. Not intended for science-engineering students.

211. Introduction to Programming (3-1-3).
Introduction to programming using Pascal. Problem solving and algorithms, elementary data structures, procedures and functions, debugging.

212. Intermediate Programming (3-1-3).
Programming methodology, problem solving, recursion, data structures, introduction to analysis of algorithms, sorting techniques. Prerequisite: Computer Science 211.

280. Mathematics of Computer Science (4-0-4).
Mathematical induction, recursive definitions and recurrence equations, finite state machines, computability. Prerequisites: Mathematics 102, Computer Science 211.

290. Computer Science Projects (1- -4).
Theoretical and experimental investigations under staff direction. Prerequisite: permission of department.

310. Programming Studio (2-6-4).
Advanced programming methods, including structured programming, team programming, program specification and testing. Prerequisites: Computer Science 212, 280.

320. Introduction to Computer Organization (3-3-4).
Basic computer architecture and assembly language programing. System software, including loaders and assemblers. Input-output devices and programing. Prerequisite: Computer Science 212.

340. Symbolic Computation (3-3-4).
Introduction to the functional, equational and logic programming paradigms. Topics include data abstraction, higher-order functions, rewriting systems, interpretation, lazy evaluation, unification and resolution. Prerequisites: Computer Science 212, 280.

382. Design Analysis of Algorithms (4-0-4).
Design and analysis of efficient computer algorithms and data structures. Prerequisites: Computer Science 212, 280. Also offered as Electrical and Computer Engineering 322.

390. Computer Science Projects (1- -4).
Theoretical and experimental investigations under staff direction. Prerequisite: permission of the department.

411. Programming Languages (3-3-4).
The design, definition and abstract implementation of programming languages including methods for precisely specifying syntax and semantics. Prerequisites: Computer Science 320, 340.

412. Compiler Construction (3-3-4).
Topics in the design of programming language translators, including parsing, run-time storage management, error recovery, code generation and optimization. Prerequisite: Computer Science 382.

421. Operating Systems and Concurrent Programming (3-3-4).
Introduction to the design, construction, and analysis of concurrent programs with an emphasis on operating systems, including filing systems, schedulers, and memory allocators. Specific attention is devoted to process synchronization and communication within concurrent programs. Prerequisites: Computer Science 212, 320. Also offered as Electrical and Computer Engineering 421.

425. Computer Systems (3-3-4).
Memory hierarchy, storage management, addressing, control, and input-output. Microprograming. Comparison of solutions to computer system design problems. Prerequisites: Computer Science 320 and Electrical and Computer Engineering 326. Also offered as Electrical and Computer Engineering 425.

440. Artificial Intelligence (3-0-3).
Techniques for simulating intelligent behavior by machine, problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programming. Computer vision, natural language understanding, the computer as a metaphor for mind. Prerequisites: Computer Science 382, Mathematical Sciences 382 or 381. Also offered as Electrical and Computer Engineering 521.

480. Concrete Mathematics (3-0-3).
Discrete and combinatorial mathematics, including sums and products, integer functions, elementary number theory, factorials, binomial coefficients, harmonic numbers, Fibonacci numbers, generating functions, asymptotic representations. Applications to advanced algorithm analysis. Not necessarily offered every year. Prerequisite: Computer Science 382.

481. Automata, Formal Languages, and Computability (4-0-4).
Finite automata, regular expressions, regular languages, pushdown automata, context-free languages, Turing machines, recursive languages, computability, and solvability. Prerequisite: Computer Science 382.

490. Computer Science Projects (1- -9).
Theoretical and experimental investigations under staff direction. Prerequisite: permission of department.

491. Computer Science Teaching (3-0-3).
A combination of in-service teaching and a seminar. Prerequisite: permission of department.

492. Computer Science Honors Project (3- -9).
Theoretical and experimental investigations under staff direction. Open only to students in the undergraduate honors program in Computer Science. Prerequisite: permission of the department.

512. Advanced Compiler Construction (3-3-4).
Advanced topics in the design and implementation of programming language translators. Data flow analysis and optimization, code generation and register allocation, attribute grammars and their evaluation, translation within programming environments, the implementation of advanced language features. Prerequisite: Computer Science 412.

519. Topics in Programming Language (3-0-3).
Content varies at the discretion of the instructor.

520. Distributed Systems (3-3-4).
Distributed systems: workstations, local area networks, server machines. Multiprocess structuring and interprocess communication. File access and memory management. User interfaces: window systems and command interpreters. Case studies of selected destributed systems. Emphasis on performance aspects of system software design. Prerequisites: Computer Science 421, 425. Also offered as Electrical and Computer Engineering 520.

525. Advanced Computer Architecture (3-0-3).
Design issues of pipelined, vector, and multiprocessor architectures. Development of performance evaluation techniques to model and simulate configuration of concurrent architectures. Software aspects of processing and their effect on performance. Prerequisite: Computer Science 425. Also offered as Electrical and Computer Engineering 525.

526. Computer Networks: Design and Analysis (3-0-3).
Design and comparison of computer networks, techniques for performance analysis, connectivity and reliability, capacity assignment. Network topologies. Local area networks including rings, busses, and contention networks. Prerequisite: Electrical and Computer Engineering 428. Also offered as Electrical and Computer Engineering 526.

529. Computer Networks: Architecture and Protocols (3-0-3).
Introduction to computer networks and computer communication. Design of protocols for error recovery, reliable delivery, routing and congestion control. Store-and-forward networks, satellite networks, local area networks and locally distributed systems. Case studies of networks, protocols and protocol families. Emphasis on software design isues in computer communication. Prerequisites: Mathematical Sciences 382, Computer Science 421. Also offered as Electrical and Computer Science 529.

530. Database Systems (3-0-3).
Survey of database system implementation and design techniques. File structures, relational, hierarchical and network schemes, query languages, protection and concurrent access. Prerequisite: Computer Science 382.

541. Applied Artificial Intelligence (3-0-3).
The uses of artificial intelligence to augment human capabilities. Decision support systems, expert systems with emphasis on applications in complex organizational settings. Conceptual and technical limitations of existing expert systems technology and possible remedies. Preresuisite: Computer Science 440.

561. Geometric Modeling (3-0-3).
Curves and surfaces: parametric form, implicit form, conversion between forms. Representation of solids: wireframes, octtrees, boundary representations, constructive solid geometry. Applications: graphics, motion planning, simulation, finite element mesh generation. Prerequisite: Computer Science 382.

581. Theory of Computation (3-0-3).
Advanced theory of computation, computational complexity, NP-complete problems. Prerequisite: Computer Science 481.

582. Advanced Algorithms (3-0-3).
Advanced design and analysis of efficient computer algorithms and data structures, lower bound techniques, semi-numerical algorithms, and fast Fourier transforms. Prerequisite: Computer Science 481.

583. VLSI Algorithms (3-0-3).
Models of parallel computation. Design and analysis of parallel algorithms. VLSI complexity: area-time tradeoffs. Area efficient VLSI networks. Prerequisite: Computer Science 382. Also offered as Electrical and Computer Engineering 519.

590. Computer Science Project (1- -9).
Advanced theoretical and experimental investigations under staff direction.

600. Graduate Seminar in Computer Science (1-0-1).
A discussion of selected topics in computer science.

611. Semantics of Programmming Languages (3-0-3).
The operational and denotational semantics of programming languages. Prerequisites: Computer Science 411, 481.

612. Graduate Seminar in Compiler Construction (2-0-2).
Topics in construction of programming language translators. Prerequisite: Computer Science 512.

619c. Teaching Advanced Placement Computer Science (3-0-3).

620. Graduate Seminar in Distributed Computing (1-0-1).
Content varies at discretion of instructor. Prerequisite: Computer Science 520.

680. Graduate Seminar Theory of Computation (1-0-1).
Content varies at discretion of instructor. Prerequisites: Computer Science 581, 582.

690. Research and Thesis (1- -15).

700c. Summer Graduate Research (1- -15).

800. Doctoral Research (1- -15).

Electrical Engineering

The George R. Brown School of Engineering

Professor Burrus, *Chair*
Professors Burrus, J.W. Clark, D. H. Johnson, de Figueiredo, Jump, Leeds, T.W. Parks, Pearson, Pfeiffer, Rabson, Tittel, and W.L. Wilson
Adjunct Professor Marowsky
Associate Professors Antoulas, Briggs, and Sinclair
Adjunct Associate Professor: Krishen, P.H. Murphy
Assistant Professors Sauerbrey, Varman, and Wisoff
Adjunct Assistant Professor Garcia
Lecturers Bourland, Cyprus, Doshi, Henson, Philippe, and Sorensen
Adjunct Lecturers Nudelmann and Papamichalis

Degrees Offered: B.A., B.S., M.E.E., M.S., Ph.D.

Undergraduate Program. The four-year program in electrical engineering leads to either the B.A. or the B.S. in Electrical Engineering. The B.S. program has more technical requirements, and is the only degree accredited by the Accreditation Board for Engineering and Technology, while the B.A. program allows more flexibility with electives. It is possible in either program to satisfy major requirements of two departments. Students may take a double major combining electrical and computer engineering with physics, mathematics, economics, languages, or other disciplines.

Students contemplating a major in electrical and computer engineering should take:
Mathematics 101, 102, 211, 212 (or the corresponding honors courses)
Physics 101, 102, 132
Computer Science 211
Engineering 241
Three courses plus one laboratory selected from:
Chemistry 101, 102, 107, Physics 201, 202, 231

One of the following to satisfy the B.S. requirement for an engineering science course from another engineering department: Engineering 200, 211, Materials Science 245, 395

Electrical Engineering 301, 305, 320, 326, 342 (all of these courses are required for the B.S. degree, while any four of them are required for the B.A. degree)

Although a general program of study can be arranged, the program in electrical engineering may be described in terms of three major areas of concentration. This program consists of six courses taken in the area of concentration (see below) and two related electrical engineering courses outside the major area. For the B.S. degree, one of those courses must be an engineering science course, and the other must be an engineering design course, except for those concentrating in Computer Science and Engineering, who must take two engineering science courses.

Circuits, Controls, and Communication Systems

This specialization is composed of three subareas: (1) circuits and electronics, (2) dynamics and control, and (3) information processing and communications. These are closely related and generally involve the study of processing and communicating signals and information through systems of devices. The major area courses are Mathematical Sciences 335, Electrical Engineering 331, 401, 430, 436, and one of Mathematical Sciences 353, 460, 463.

Computer Science and Engineering

This program is divided into the following three topics: (1) hardware engineering, (2) software engineering, and (3) discrete system modeling. The major area courses are Mathematical Sciences 381, Electrical Engineering 425; 322, 421, or 426; and Computer Science 280, 310, or 481.

Lasers, Microwaves, and Solid-State Electronics

This area of concentration permits undergraduate students to study and participate in several specialties, including laser technology, optical communication systems, application and development of tunable laser devices, semiconductor devices, opto-electronic devices, and integrated optics and VLSI circuits. The major area courses are Mathematical Sciences 340, Electrical Engineering 306, 459, 461, 462, 463.

In addition to the departmental requirements for the major, students seeking the B.A. degree must also satisfy the distribution requirement and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 130

semester hours. For the B.S. degree, no fewer than 42 semester hours outside departmental requirements for a total of 133 semester hours are required. See Degree Requirements and Majors, pages 54-68.

Graduate Program. Requirements of a general nature for advanced degrees are outlined on pages 106-113. In addition to the above areas, there is a graduate program in bioengineering. Students should consult departmental advisers for specific courses of study.

A candidate for the professional degree of Master of Electrical Engineering is required to complete an approved sequence of ten advanced courses. See Professional Degrees in Engineering, page 108.

A candidate for the Master of Science degree in the Department of Electrical and Computer Engineering is required to complete an approved course of study. In addition, the candidate is required to complete an approved research program and submit an acceptable thesis. A semester or more of supervised teaching is required as a valuable part of graduate education. The M.S. degree is not a terminal degree, but part of the Ph.D. program at Rice.

The granting of the Doctor of Philosophy degree presupposes academic work of high quality and demonstrated ability to do independent and creative research. To be admitted to candidacy, the student must obtain high standing in an approved course program and perform satisfactorily on qualifying examinations. Normally, the candidate completes the requirements for an M.S. degree as part of the Ph.D. program. Qualified students may, upon recommendation of the department and approval of the Graduate Council, enter a program leading directly to the Doctor of Philosophy degree after completing the bachelor's degree. The candidate must participate in a program of supervised teaching. Emphasis is placed on research leading to a satisfactory dissertation. Each candidate takes a final oral examination. The doctoral candidate should expect to spend a minimum of three academic years of graduate study in this program.

In addition to the regular graduate programs, there are four interdisciplinary graduate programs designed particularly for those who received their previous degree(s) in mathematics, physics, chemistry, or other sciences, including undergraduate engineering science programs, but who have become interested in the engineering applications appropriate to a particular field of science. These programs are systems theory, solid-state electronics and materials science, computer science and bioengineering.

Electrical Engineering Courses

301b,a. Network and Systems Theory (3-0-3).
Analysis of linear systems using circuits as the primary example. Time and frequency domain analysis: solution of differential equation, convolution, and the Laplace transform. State-variable analysis. Limited enrollment. Prerequisite: Engineering 241.
Mr. Henson, Mr. Antoulas

305a,b. Electromagnetic Fields and Waves (3-0-3).
Distributed systems. Transmission lines. Smith Charts and impedance matching. Static and oscillatory fields. Maxwell's equations. Interaction of waves with media antennae.
Mr. Sauerbrey, Mr. Tittel

306b. Electromagnetic Field Theory (3-0-3).
Electrostatic fields and boundary value problems. Magnetic fields and interaction with materials. Time dependent electromagnetic fields. Plane waves, waveguides, and resonators.
Mr. Wisoff

320a. Introduction to Computer Organization (3-3-4).
Basic computer architecture and assembly language programming. Systems software, including loaders and assemblers. Input-output devices and programming. Prerequisite: Computer Science 211.

Mr. Varman

322b. Design/Analysis of Algorithms (3-3-4).
Design and analysis of efficient computer algorithms and data structures. Prerequisite: Computer Science 212, 280. Also offered as Computer Science 382.

326b,a. Digital Logic Design (3-3-4).
Gates, flip-flops, combinational and sequential switching circuits, registers, data transfer paths, logical and arithmetic operations. Prerequisite: Computer Science 211, Engineering 241.

Mr. Cyprus, Mr. Sorensen

331b,a. Applied Probability (3-0-3).
Concepts, interpretations, elementary techniques, and applications of modern probability theory, including a brief introduction to statistical inference. Prerequisite: Mathematics 102. Also offered as Mathematical Sciences 381.

Mr. Pfeiffer

342a,b. Electronic Circuits (3-3-4).
Models of transistors, FETs, and integrated circuits. Biasing methods, two-port analysis, single and multistage amplifiers, frequency domain characteristics, feedback, stability, oscillators, power amplifiers. Prerequisite: Engineering 241.

Mr. Wilson, Mr. Rabson

401a. Signals and Linear Systems (3-0-3).
Representation and analysis of signals and linear systems using Fourier transforms and convolution. Applications include modulation, gating, sampling, and filtering. Generalized functions and transforms. Bilateral Laplace and Z transforms. Prerequisite: Electrical and Computer Engineering 301 and a knowledge of complex variable theory.

Mr. Antoulas

421b. Operating Systems and Programs (3-3-4).
Introduction to the design, construction, and analysis of concurrent programs with an emphasis on operating systems, including filing systems, schedulers, and memory allocators. Specific attention is devoted to process synchronization and communication within concurrent programs. Prerequisites: Computer Science 212, Electrical and Computer Engineering 320. Also offered as Computer Science 421.

425a. Computer Systems (3-3-4).
Memory hierarchy, storage management, addressing, control, and input-output. Microprogramming. Comparison of solutions to computer system design problems. Prerequisites: Electrical and Computer Engineering 320, 326. Also offered as Computer Science 425.

Mr. Sinclair

426b. Digital System Design (3-3-4).
Digital system organization, microprogrammed control units, bus architectures, microprocessors, memory organizations, and high speed arithmetic. Prerequisite: Electrical and Computer Engineering 320, 326.

Mr. Jump

427a. Pulse and Digital Circuits (3-3-4).
Discrete and integrated solid state circuits. Interaction of linear components with diodes, bipolar transistors, and field effect transistors. Monostable, bistable, and astable multivibrators. Applications of linear one and two degree of freedom circuits to digital hardware. Analysis of circuits and their interconnection to form digital systems. Construction of digital projects from discrete and integrated circuits. Prerequisite: Electrical and Computer Engineering 342 and 326.

Mr. Cyprus

428b. Computer Systems Performance (3-3-4).
Analytical models of computer systems. Queueing theory and Markov chains. Simulation and analysis of simulation results. Operational analysis. Course will include a project. Prerequisites: Electrical and Computer Engineering 425, Mathematical Sciences 381 or 382.

Mr. Doshi

430b. Communication Theory and Systems (3-0-3).
Review of applied probability theory. Introduction to stochastic processes. Complex-signal analysis. AM and FM. Digital communication, PCM, signal transmission, optimum receiver theory, information theory and coding. Prerequisite: Electrical and Computer Engineering 401 and either 331 or Mathematical Sciences 382.

Mr. Aazhang

436b. Control Systems I (3-0-3).
Representation, analysis, and design of simple control systems in the frequency domain. Prerequisite: Electrical and Computer Engineering 301.

Mr. Henson

438b. Remote Sensing (3-0-3).
Remote sensing using wave propagation. Statistical formulation of diffraction problems. Wave scattering from rough surfaces. Applications include monitoring from space and non-contact sensing for robotics and automation.

Mr. Krishen

442a. Advanced Electronic Circuits (3-0-3).
Electronic circuits used in communication and other systems, including principles of feedback, modulation, detection, and active filtering. Emphasis on design. Prerequisite: Electrical and Computer Engineering 342.

Mr. Leeds

459a. Quantum Mechanics (3-0-3).
Schroedinger's equation; harmonic oscillators; band theory of solids; hydrogen molecule; spins and angular momentum; interaction of matter with radiation; spectroscopy; scattering processes and nonlinear susceptibility; quantum statistics; transport phenomena.

Mr. Wisoff

461a. Electrical Properties of Materials (3-0-3).
Properties and parameters of dielectric, conducting, and semiconducting materials important in the understanding of device characteristics. Corequisite: Electrical and Computer Engineering 459.

Mr. Rabson

462b. Semiconductor Devices (3-4-4).
Physical principles and operational characteristics of semiconductor devices. Prerequisite: Electrical and Computer Engineering 461.

Mr. Wilson

463b. Quantum Electronic Devices (3-0-3).
Lasers, optoelectronics, integrated optics, nonlinear optics, holography, and optical processing.

Mr. Sauerbrey

481a. Bioengineering I (3-0-3).
An introduction to the basic concepts of medical electrophysiology including studies of the genesis of electrical activity in nerve and muscle (both skeletal and cardiac), measurement instrumentation systems and mathematical modeling techniques. These fundamental topics lead to detailed discussion of the more common electrical signals recorded from the body for diagnostic purposes (e.g. the electromyogram and the electrocardiogram). Basic electrical recording methods will be discussed including electrode systems and electronic amplifiers. Mathematical models of cellular excitation processes will be developed and discussed, along with numerical methods for solving the model equations. A term project is required. Prerequisite: Engineering 241.

Mr. Clark

482b. Bioengineering II (3-4-4).
A continuation of Electrical and Computer Engineering 481 focusing on several large organ systems including the cardiovascular and pulmonary systems. Advanced topics in amplifier design will be covered along with instrumentation used in measuring variables associated with these organ systems (e.g. pressure, temperature and length transducers). Mathematical models of these systems and numerical methods for obtaining solutions will be discussed. A term project is required. Prerequisites: Electrical Engineering 342, 301, 481.

Mr. Clark

490a. Electrical Engineering Projects (Variable).
Theoretical and experimental investigations under staff direction.

496a. Robotics Laboratory (1-0-1).
Computer vision experiments, programming a mobile robot and an industrial-type PUMA robot, operating a CNC mill and an industrial-size CNC lathe, projects.

Mr. Cheatham

498b. Introduction to Robotics (3-0-3).
A survey of topics in robotics including kinematics, dynamics and control theory applied to robotics. Lectures are given on image processing and computer vision, voice synthesis and speech recognition, artificial intelligence, and computer robot simulation. Laboratory includes programming of Microbot and PUMA robotic arms.

Mr. Cheatham

501a. Linear System Theory (3-0-3).
Advanced topics in linear systems. Realization theory. Matrix fraction description of multivariable systems. Stabilization, regulation. Prerequisite: Electrical and Computer Engineering 301 or equivalent.

Mr. Pearson

505a. Advanced Electrical Field Theory (3-0-3).
Boundary-value problems in electrostatics and magnetostatics. Propagation of electromagnetic waves in free space, in conducting media, and in anistropic dielectrics.

Mr. Tittel

506b. Applications of Electromagnetic Field Theory(3-0-3).
Waveguides and cavities, antennae, diffraction, holography, magnetohydrodynamics, and radiation from moving charges.

Mr. Rabson

507a. Nonlinear Analysis (3-0-3).
Analytical methods, including singular point and phase plane analysis, describing functions, stability analysis via Lyapunov functions; analog and digital computer simulation methods; parameter estimation and sensitivity analysis.

Mr. Clark

519b. VLSI Algorithms (3-0-3).
Models of parallel computation. Design and analysis of parallel algorithms. VLSI complexity. Area-time tradeoffs. Area efficient VLSI networks. Prerequisite: Electrical and Computer Engineering 322. Also offered as Computer Science 583.

Mr. Varman

520a. Distributed Systems (3-3-4).
Distributed systems: workstations, local area networks, server machines. Multiprocess structuring and interprocess communication. File access and memory management. User interfaces: window systems and command interpreters. Case studies of selected distributed systems. Emphasis on performance aspects of system software design. Prerequisite: Electrical and Computer Engineering 421, 425. Also offered as Computer Science 520.

521b. Artificial Intelligence (3-3-4).
Techniques for simulating intelligent behavior by machine: problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programming. Prerequisites: Electrical and Computer Engineering 322; 331 or Mathematical Sciences 382. Also offered as Computer Science 440.

525a. Advanced Computer Architecture (3-0-3).
Design issues of pipelined, vector, and multiprocessor architectures. Development of performance evaluation techniques to model and simulate configurations of concurrent architectures. Software aspects of processing and their effects on performance. Prerequisite: Electrical and Computer Engineering 425. Also offered as Computer Science 525.

Mr. Doshi

526a. Computer Networks: Design and Analysis (3-0-3).
Design and comparison of computer networks; techniques for performance analysis; connectivity and reliability; capacity asignment. Network topologies. Local area networks, including rings, busses, and contention networks. Prerequisite: Electrical and Computer Engineering 428. Also offered as Computer Science 526.

Mr. Sinclair

529b. Computer Networks: Architecture and Protocols (3-0-3).
Introduction to computer networks and computer communication. Design of protocols for error recovery, reliable delivery, routing and congestion control. Store-and-forward networks, satellite networks, local area networks, and locally distributed systems. Case studies of networks, protocols and protocol families. Emphasis on software design issues in computer communication. Prerequisites: Mathematical Sciences 382, Electrical and Computer Engineering 421. Also offered as Computer Science 529.

530b. Detection Theory (3-0-3).
Review of stochastic processes, Karhunen-Loeve expansion, transmission and reception of digital signals over a variety of channels; intersymbol interference and equalization. Additional topics vary from year to year in modern communication theory. Prerequisite: Electrical and Computer Engineering 430.

Mr. Johnson

531a. Digital Signal Processing (3-0-3).
Analysis of discrete-time signals and systems. Design and implementation of digital filters. Efficient algorithms for the discrete Fourier transform and for convolution. Prerequisite: Electrical and Computer Engineering 401 or a senior-level course in signals and linear systems.

Mr. Burrus

533a. Introduction to Random Processes and Applications (3-0-3).
Review of basic probability; Sequence of random variables; Random vectors and estimation; Basic concepts of random processes; Random processes in linear systems, expandion of random processes; Wiener filtering; Spectral representation of random processes; White-noise integrals. Also offered as Mathematical Sciences 583.

Mr. Aazhang

534a. Estimation Theory (3-0-3).
See Mathematical Sciences 584. Prerequisite: Electrical and Computer Science 430. Also offered as Mathematical Sciences 584.

Mr. de Figueiredo

536b. Control System Synthesis (3-0-3)
Optimal synthesis of control systems using H^2, H^∞ and l^1 norms. Stability robustness. Computational solutions using state space methods. Prerequisite: Elec 501.

Mr. Pearson

537a. Introduction to Artificial Intelligence (3-0-3).
This course is intended to introduce the student with the fundamental problem solving techniques of Artificial Intelligence (AI). This will be achieved through intermixing of an introduction to Symbolic Manipulation (through LISP programming) and a presentation of selected current AI topics. Emphasis will be placed on expert systems, which are powerful engineering problem-solving tools. Enrollment limited to seniors and graduate students. Prerequisite: Introductory computer science and probability course. Also offered as Mechanical Engineering 537.

Mr. Philippe

539b. Digital Image Processing (3-0-3).
Modern techniques in 2D- and 3D-image processing. Color imaging. Scene analysis and robotic vision.

Mr. de Figueiredo

560a. VLSI Design (3-3-4).
A study of VLSI technology and design. MOS devices, characteristics and fabrication. Logic design and implementation. VLSI design methodology, circuit simulation and verification. Course includes group design projects. Prerequisites: Electrical and Computer Engineering 326, 305.

Mr. Jump, Mr. Wilson

562a. Microwave Engineering (3-4-4).
Waveguides and resonant cavities. Scattering matrix, application to two-, three-, and four-port devices. Broadband transformers, couplers, and filters. Microwave generation. Tensor susceptibility and nonreciprocal devices. Prerequisite: Electrical and Computer Engineering 306.

Mr. Wilson

563a. Introduction to Solid State Physics I (3-0-3).
Fundamental concepts of crystalline solids, including crystal structure, band theory of electrons, and lattice vibration theory. Also offered as Physics 563.

Mr. Rau

564b. Introduction to Solid State Physics II (3-0-3).
Continuation of Electrical and Computer Engineering 563, including scattering of waves by crystals, transport theory, and magnetic phenomena. Also offered as Physics 564.

Mr. Rau

569b. VLSI Design Laboratory (0-3-1).
Testing and evaluation of VLSI circuits designed in Electrical and Computer Engineering 560. Prerequisite: Electrical and Computer Engineering 560.

Mr. Jump, Mr. Wilson

590a,b. Electrical Engineering Projects (Variable).
Theoretical and experimental investigations under staff direction.

Mr. Johnson

591a. Optics (3-0-3).
Survey covering important aspects of classical optical theory, wave properties of light, and the Fourier analysis approach to physical optics. Holography, integrated optics, and fiber optics.

Mr. Tittel

592b. Topics In Quantum Optics (3-0-3).
Latest developments in lasers, optical pumping, Raman and Brillouin spectroscopy, and mode locking. Not offered every year.

Mr. Sauerbrey, Mr. Wisoff

594b. Seminar in Biomedical Engineering (3-0-3).
A seminar course focusing on a specific area of biomedical research interest and involving both students and faculty from other universities in the Houston area. This course is taught under the sponsorship of the Houston Biomedical Engineering Society and exposes students to an intense treatment of a specific biological system from several scientific and engineering viewpoints. The faculty will consist of engineers and physicians from Rice University, The University of Houston, Baylor Medical School, University of Texas Medical School at Houston, and M. D. Anderson Cancer and Tumor Institute. The topic to be studied this year is the "Electrophysiology of Spinal Cord and Peripheral Nervous System." Graduate students in chemical, electrical, and mechanical engineering are particularly encouraged to attend.
Mr. Clark

619b. Advanced Topics in Parallel Processing (3-0-3).
Mr. Varman

625a. Advanced Topics in Computer Architecture (3-0-3).
Variable topics. (Not offered 1987-88.)

632b. Speech Signal Processing (3-0-3).
Acoustic models of speech production. Pitch and format structure of speech. Estimation of speech spectra: short-time Fourier analysis, filter banks, homomorphic signal processing, auto-regressive models. Pitch detection. Vocoding algorithm: channel vocoders, homomorphic vocoders, linear predictive vocoders. Prerequisite: Electrical and Computer Engineering 531.
Mr. Papamichalis

690b. Projects (3-0-3).
Staff

691a. Seminar in Quantum Electronics (1-0-1)
Graduate Seminar with variable topics.
Sauerbrey & Wisoff

692b. Microwave Engineering (Variable).
Mr. Wilson

693a. Advanced Topics in Computer Engineering (3-0-3).
Graduate seminar. Varying topics.
Mr. Jump

694b. Advanced Topics in Computer Systems (3-0-3).
Mr. Sinclair

696b. Digital Signal Processing (3-0-3).
Advanced topics in digital signal process: time varying systems, multidimensional signal processing, and other topics of current interest. Individual projects are a part of this course.
Mr. Burrus

698b. Advanced Topics in Robotics (3-0-3).
Mr. Cheatham

800a,b. Research and Thesis (Variable).

Environmental Science and Engineering

The George R. Brown School of Engineering

Professor C.H. Ward, *Chair*
Professors Andrews, Bedient, Few, and Tomson
Adjunct Professors Keeley, Dunlap, and Raymond
Adjunct Associate Professors Pier, Schaezler, and Wilson

Degrees Offered: B.A., M.E.E., M.E.S., M.S., Ph.D.

Undergraduate Program. The major in environmental science (offered only as a double major with other fields of science or engineering) is intended for students wishing academic training oriented toward the solution of technical environmental problems and leads to the B.A. degree.

General requirements during the first two years include: two years of mathematics, one and one-half years of chemistry, and one year of physics. Specific courses to satisfy these requirements vary somewhat and should be determined in consultation with a departmental adviser. For the B.A. degree, a minimum of 12 semester hours of environmental science and engineering courses are required during the junior and senior years. The undergraduate B.A. double major curriculum has been designed with maximum flexibility and minimum specific requirements to encourage interdepartmental study with all other fields of science and engineering. A list of suggested electives in various fields of science, engineering, humanities, and social science is available for students desiring additional guidance or specialization.

The total number of semester hours required for the B.A. with a double major depends on departmental requirements for the other major. Generally, however, in addition to the departmental requirements for the majors, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Undergraduates interested in environmental engineering should contact the Department of Civil Engineering for information on the B.S. degree program with an environmental option.

The introductory course, Environmental Science 201, is intended for both majors and nonmajors. Humanities majors are encouraged to consider this course for science distribution requirements.

Successful completion of the four-year curriculum leading to the Bachelor of Arts with environmental science as part of a double major qualifies the student for possible admission to a fifth year of specialized study leading to the professional degree of Master of Environmental Science (M.E.S.). Completion of a four-year curriculum leading to the Bachelor of Science in any field of engineering (civil and chemical preferred) qualifies the student for possible admission to a fifth year of specialized study leading to the professional degree of Master of Environmental Engineering (M.E.E). These recognized professional degrees in the environmental field are differentiated on the basis of science or engineering orientation and are described on page 108. Outstanding students wishing to pursue careers in teaching and research are qualified for graduate study after the B.A., B.S., M.E.S., M.E.E., and M.S. degrees.

Graduate Program. The graduate programs in environmental science and environmental engineering are interdepartmental activities and lead to the the M.E.E., M.E.S., Master of Science, and Doctor of Philosophy degrees. Applicants for admission to the environmental science program may hold the baccalaureate or master's degree in any of

the sciences or mathematics. Applicants for the environmental engineering program must hold accredited baccalaureate or master's degrees in an area of engineering. Although the main research activities in the department are concerned with ground water contamination, water and waste water engineering, water resources management, and applied water chemistry, the program serves as the focal point for universitywide study and research in the broad human-environment problem spectrum. Faculty members from the Departments of Chemical Engineering, Space Physics and Astronomy, Architecture, Biology, Geology, and Mathematical Sciences participate in this interdisciplinary research. Graduate students enrolled in any of these departments and interested in environmental problems for thesis topics may use facilities of the Department of Environmental Science and Engineering and are eligible for financial assistance in the form of graduate research assistantships and fellowships.

Candidates for the Master of Science or Doctor of Philosophy degrees may pursue course programs designed to both complement and supplement their backgrounds through major and minor emphasis areas. However, formal minors are not required. University requirements for the advanced degrees are presented on pages 106-113.

Graduate students in environmental science or engineering take the majority of their courses in other departments. A candidate for the Master of Science degree must complete a minimum of eight approved semester courses and present and defend, in oral examination, a research thesis. Normally, two academic years and the intervening summer are required for the degree.

Candidates for the Doctor of Philosophy must demonstrate their competence in three areas corresponding to major and minor course emphasis. In particular, a candidate for the Doctor of Philosophy must: (1) complete a rigorous list of approved courses with high standing; (2) pass a preliminary examination to evaluate preparation for doctoral studies in the field of Environmental Science and Engineering; (3) pass a qualifying examination on course work, proposed research and related topics; (4) complete a thesis indicating the candidate's ability to do original research; and (5) pass a formal public oral examination on the thesis and related topics.

Environmental Science and Engineering

Environmental Science and Engineering Courses

201a. Introduction to Environmental Systems (3-3-4).
Chemical, physical, and biological components of the environment and the effects of pollution on their maintenance and utilization. Also offered as Health Education 201.
Mr. Ward

321a. Environmental Geology (3-0-3).
Study of evolutionary mechanisms by which life has adjusted to terrestrial conditions and industrial impacts on these adjustments. For non-majors only. Also offered as Geology 321.
Mr. Adams

401a. Introduction to Environmental Chemistry (3-3-4).
Fundamental principles of environmental chemistry and measurements.
Mr. Tomson

403a. Water and Wastewater Treatment (3-0-3).
Fundamental principles of water and wastewater treatment systems and their application to the design and operation of treatment plants.
Mr. Andrews

406b. Introduction to Environmental Law (3-0-3).
Legal techniques used by societies to plan and regulate the use of environmental resources.
Mr. Blackburn

412b. Hydrology and Watershed Analysis (3-3-4).
Fundamentals of the hydrologic cycle, hydrograph techniques, flood routing, and open channel flow; local watershed application and laboratory. Also offered as Civil Engineering 464.
Mr. Bedient

443a. Introduction to Atmospheric Science (3-0-3).
Fundamentals of meteorology, climatology, and predictive meteorology and climatology. Also offered as Space Physics 443 and Mechanical Engineering 477.
Mr. Few

445a. Natural Environmental Factors in Community Development (3-0-3).
Readings, discussion, and review of data sources on natural environmental factors affecting and affected by the development of the built environment. Also offered as Architecture 645.
Mr. Blackburn

490a,b. Special Study and Research (Variable).
Open to environmental science or engineering majors with permission of chairman. Written thesis required.

511a. Environmental Physiology and Toxicology (3-0-3).
Physical and chemical environment as it affects the physiology and population dynamics of organisms (including humans). Stability and maintenance of biogeochemical cycles. (University of Texas School of Public Health).

512b. Environmental Physiology and Toxicology (3-0-3).
See Environmental 511. (University of Texas School of Public Health).

518a. Ground Water Hydrology (3-0-3).
Topics include groundwater hydrology, flow in porous media, well mechanics, water quality, geology. Concepts of pollutant transport in aquifer systems, numerical methods, and computer applications are covered in detail.
Mr. Bedient

536b. Biological Processes for Wastewater Treatment (3-0-3).
Theory and application of biological processes as used in wastewater treatment. An introduction to mathematical modeling, computer simulation, reactor design, and process dynamics and control as they apply to wastewater treatment.
Mr. Andrews

550b. Applied Water Chemistry (3-0-3).
Designed to provide a theoretical basis for considering the chemistry of natural and waste waters and treatment processes.
Mr. Tomson

564b. Atmospheric Dynamics (3-0-3).
See Space Physics 564.
Mr. Few

601a. Seminar (3-0-3).
Continuing seminar on environmental research.

602b. Seminar (3-0-3).
See Environmental Science and Engineering 601.

631a. Water Treatment Systems (Variable).
Emphasizes dynamics and control of water and wasterwater systems. An advanced topics course.
Mr. Andrews

632b. Water and Wastewater Systems (Variable).
See Environmental Science and Engineering 631.
Mr. Andrews

634a. Ground Water Transport (3-0-3).
Formal lecture and student projects, literature review, transport theory, water quality models and numerical techniques, computer applications. An advanced topics course.
Mr. Bedient

635a. Water Chemistry (Variable).
Formal lecture and assigned reading in topics such as redox kinetics and thermodynamics, absorption and desorption, and the associated mathematics. An advanced topics course.
Mr. Tomson

636b. Water Chemistry (Variable).
See Environmental Science and Engineering 635.
Mr. Tomson

651a. Master's Research and Thesis (Variable).

652b. Master's Research and Thesis (Variable).

800a,b. Ph.D. Research And Thesis (Variable).

Mathematical Sciences

Professor Wang, *Chair*
Professors Akin, Bixby, S.H. Davis, de Figueiredo, Dennis, Miele, Pfeiffer, D. W. Scott, Symes, Tapia, J. R. Thompson, Walker, Wheeler, and Young
Adjunct Professors Glowinski, Kendall, Middleton, Morshedi, Peaceman
Assistant Professor Boyd

Degrees Offered: B.A., M.A.Ma.Sc., M.A., Ph.D.

Undergraduate Program. The program allows each student considerable freedom to plan a course of study consistent with his or her particular interests in mathematics and its applications. Available courses provide foundations for applications to many fields of engineering, physical sciences, life sciences, behavioral and social sciences, and computer science.

Within the flexible framework of University requirements, the program consists of three parts: (1) basic courses in mathematics and computer science, (2) introductory courses in appropriate areas of mathematical sciences, and (3) electives for which major credit is given.

1. Students normally take eight basic courses, as follows:
   Calculus — Mathematics 101, 102 (or honors equivalent);
   Differential equations — Mathematics 211;
   Multivariable calculus — Mathematics 212;
   Linear algebra — Mathematics 355 or Mathematical Sciences 310;
   Discrete mathematics — Computer Science 280 or Mathematics 356;
   Computer programming — Computer Science 211 or 212;
   Model building — Statistics Sciences 300, 301, or approved alternate.

2. Students take one course in three of the following areas:
   Computing — At least three hours of Computer Science in addition to the above;
   Numerical analysis — Mathematical Sciences 353, 451, 452, or 454;

Operations research/optimization — Mathematical Sciences 460, 471, 472, 475, or 476; or Economics 472.
Physical mathematics: Mathematical Sciences 330 or 340, or Mathematics 381 or 382;
Applied probability: Mathematical Sciences 381, or Statistics 382.

3. Students also take elective courses for credit toward the mathematical sciences major, as follows:
Two additional courses in one of the areas selected above;
One further course in mathematical science, computer science, statistics, or mathematics;
Approved electives to bring total major requirements to 59 semester hours.

In addition to departmental requirements for the major, students must also satisfy University distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

A student contemplating a major in Mathematical Sciences is encouraged to contact any member of the Department, particularly a member of its undergraduate committee. A faculty member will help the student explore possible programs suited to his or her individual needs and interests.

The Department of Mathematical Sciences participates in the interdisciplinary program in Managerial Studies. More information may be obtained from the description Managerial Studies program on pages 272-273.

Graduate Program. Admission to graduate study in mathematical sciences is open to qualified students holding bachelor's or master's degrees (or their equivalent) in engineering, mathematics, or physical, biological, mathematical, or behavioral sciences. The credentials of each applicant will receive individual evaluation by the faculty of the department. A complete application folder should include the quantitative, verbal, and advanced scores from the Graduate Record Examination, all transcripts, and evidence of proficiency in English (such as the TOEFL) where appropriate.

The graduate program is designed for students seeking the professional degree of Master in Applied Mathematical Sciences or the research degrees of Master of Arts or Doctor of Philosophy. It normally takes one or two years to obtain a master's and three or four years to obtain a doctorate. A master's degree is not a prerequisite for the doctoral degree.

The professional degree emphasizes the applied aspects of the mathematical sciences. This degree is intended for persons who plan careers as practitioners rather than primarily as researchers. Presently, this degree emphasizes the following areas, singly or in combination: (1) general applied mathematics, (2) operations research, and (3) numerical analysis. Further information about this degree may be obtained from the Department.

The granting of a research degree presupposes demonstrated ability to do advanced original research. Students are encouraged to initiate research activities at the earliest possible time in their graduate study. Presently, the research interests of the faculty are in the following four major areas: (1) numerical analysis and computation, (2) physical mathematics, (3) operations research, (4) mathematical modeling in physical, biological, or behavioral sciences. Further information about these areas may be obtained from the department.

Graduate fellowships, research assistantships, and graduate scholarships are available and are awarded on the basis of merit to qualified students. Current practice in the department is for most doctoral students in good standing to receive some financial aid. As an integral part of their scholastic programs, all graduate students are expected to attain some proficiency in teaching by engaging in instructional assignments of the Department.

Requirements for the Degree of Master in Applied Mathematical Sciences:

1. Satisfactory completion of at least 30 semester hours of coursework approved by the department.
2. At most two courses may be at the 300- (junior) level; at most two may be taken outside the department; and at most two courses may be transferred.

Requirements for the Degree of Master of Arts:

1. Satisfactory completion of at least 30 semester hours (including thesis) at the graduate level. Normally five courses must be in Mathematical Sciences.
2. An original thesis acceptable to the department. Note, however, that successful performance on the qualifying examination fulfills the master's thesis requirement for a student working toward the Ph.D. degree.
3. Satisfactory performance on a public oral examination on the thesis; the procedure for the public oral examination is given in the general rules of the University.

Requirements for the Degree of Doctor of Philosophy:

1. Satisfactory completion of courses of study approved by the department. At least two courses outside the department are required.
2. Satisfactory performance on preliminary and qualifying examinations and reviews.
3. Satisfactory completion of two semester courses or a reading examination on an approved foreignlanguage.
4. An original thesis acceptable to thedepartment.
5. Satisfactory performance on a final public oral examination on the thesis; the procedure is given in the general rules of the University.

Mathematical Sciences

Mathematical Sciences Courses

223. Introduction to Computing (Variable).
A self-paced, variable-credit course in the use of the programming languages APL and FORTRAN 77 to solve technical problems. The course is divided into four parts: basic and advanced levels of the use of each language. Each part may be taken in separate semesters, with either language taken first. No more than four hours of credit may be taken. Numerical techniques for solving systems equations and computer graphics are emphasized.

310. Linear Algebra (3-0-3).
Concepts and results of linear algebra useful in a variety of fields of application.

330. Complex Variables (3-0-3).
Introduction to basic concepts of complex variable theory and applications to the solution of physical problems. Prerequisite: Mathematics 211.

340. Partial Differential Equations (3-0-3).
Elementary methods for the solution of partial differential equations and boundary value problems in engineering and physical sciences. Prerequisite: Mathematical 211.

353. Computational Numerical Analysis (3-0-3).
An introductory course in numerical analysis with computer applications. Prerequisite: Mathematics 211.

376. Quantitative Analysis (3-0-3).
Mathematical models in deterministic and stochastic situations, including linear programing, inventory theory, decision theory, waiting line theory. Prerequisite: a statistics course.

381. Introduction to Applied Probability (3-0-3).
Concepts, interpretations, elementary techniques, and applications of modern probability theory. Prerequisite: Mathematics 102. Also offered as Electrical and Computer Engineering 331 and Statistics 381.

411. Group Theory for Chemists and Physicists I (3-0-3)
Symmetries of physical laws and structures and associated transformation groups. Applications to problems in atomic, solid state, and molecular physics and chemistry. Prerequisite: linear algebra and elementary quantum mechanics. Not offered every year.

417. Combinational Analysis (3-0-3)
Solution of enumeration problems using the methods of inclusion and exclusion, generating functions, distributions, permutations, and graphical enumeration. Not offered every year.

432. Tensor Analysis (3-0-3).
Review of linear algebra. Tensor algebra. Tensor analysis on Euclidean spaces. Applications to particle mechanics, continuum mechanics, and electromagnetic theory. Prerequisite: linear algebra.

440. Mathematical Methods in Physics and Engineering (3-0-3)
Application of linear operator theory and transform techniques in the solution of ordinary and partial differential equations. Prerequisite: Mathematical Sciences 330 or Mathematics 382.

451. Numerical Linear Algebra (3-0-3).
A study of numerical methods in linear algebra.

452. Computational Methods for Differential Equations (4-0-4).
Finite difference, variational, and collocation methods for approximating numerically the solutions of ordinary and partial differential equations. Computer implementation to verify convergence to the solution.

453. Numerical Analysis of Ordinary Differential Equations (3-0-3).
Runge-Kutta, linear, multistep methods; stability analysis and stiffness for initial-value problems; finite difference, finite element, collocation, and shooting methods for two-point boundary value problems. Prerequisite: Mathematics 211.

454. Computational Methods for Nonlinear Systems (3-0-3).
Analysis and computer applications of modern methods for solving nonlinear algebraic systems and nonlinear constrained optimization problems in R^n. Prerequisite: Mathematics 211, 212, linear algebra.

460. Optimization Theory (3-0-3).
Derivation and application of necessity conditions and sufficiency conditions for constrained optimization problems. Prerequisite: Mathematics 212 and linear algebra.

471. Linear Programming (3-0-3).
Formulation of managerial and technical problems; simplex method; revised simplex method; duality theory and applications; transportation problems; decomposition techniques. Also offered as Economics 471.

472. Game Theory and Decision Analysis (3-0-3).
Matrix games; relation to linear programming; nonzero sum games; games against nature; decision trees; models for group decisions; utility theory; benefit-cost models.

475. Operations Research, Deterministic Models (3-0-3).
Optimization problems in a managerial and economic context. Familiarity with linear programming and microeconomic theory is strongly recommended. Also offered as Economics 475.

476. Operations Research, Stochastic Models (3-0-3).
Decision theory, waiting line theory, Markov chains, inventory models replacement models, simulation. Prerequisite: Mathematical Sciences 381 or Statistics 382. Also offered as Economics 476.

477. Mathematical Structure of Economic Theory I (3-0-3)
Exposition of the theory of competitive economies from a mathematical perspective, unifying calculus, matrix algebra, and set-theoretic approaches. Prerequisite: Economics 211, Mathematics 212, Mathematical Sciences 310. Also offered as Economics 477. Not offered every year.

478. Mathematical Structure of Economic Theory II (3-0-3)
Continuation of Economics/Mathematical Sciences 477, which is a prerequisite. Also offered as Economics 478. Not offered every year.

483. Markov and Martingale Sequences. Renewal Processes (3-0-3)
The Markov property and Markov sequences. Discrete-parameter martingales. Poisson and other renewal processes. Prerequisite: Mathematical Sciences 381. Also offered as Statistics 483. Not offered every year.

490a. Independent Study (Variable).

491b. Independent Study (Variable).

533. Advanced Tensor Analysis (3-0-3).
Differential and integral calculus on manifolds. Riemannian geometry. Calculus of variations. Hamilton-Jacobi theory. Applications to analytical mechanics, relativity and continuum mechanics. Prerequisite: Mathematical Sciences 432. Offered occasionally.

535. Mathematical Theory of Nonlinear Elasticity (3-0-3)
Representation theory for the constitutive relations for elasticity; homogeneous and inhomogeneous bodies; wave propagation; second-order elasticity and approximations. Prerequisite: Mechanical Engineering 511, 512, or Mathematical Sciences 432. Offered occasionally.

540. Applied Functional Analysis (3-0-3)
Applications of basic concepts and theorems in functional analysis to mechanics, quantum mechanics, and/or optimal control problems.

541. Introduction to Linear Partial Differential Equations (3-0-3)
Distributions, Sobolev spaces, pseudodifferential operators. Interior estimates for elliptic systems; well-posedness of hyperbolic initial value problems; propagation of singularities. Boundary regularity for second-order elliptic equations.

542. Partial Differential Equations (3-0-3)
Selected topics. Sequel to 541.

544. Mathematical Methods of Physics (3-0-3)
Selected mathematical techniques useful in the solution of problems in physics and space physics. Prerequisite: Physics 301, 302; Mathematical Sciences 440 is recommended. Not offered every year.

551. Advanced Numerical Linear Algebra (3-0-3)
The content of this course varies from year to year. It may be repeated if the change in content justifies.

552. Numerical Methods Partial Differential Equations I (3-0-3).
Analysis of modern numerical methods, including finite-difference methods, finite-element methods, collocation methods, and associated algebraic problems. Not offered every year.

553. Numerical Methods Partial Differential Equations II (3-0-3).
Continuation of Mathematical Sciences 552.

554. Numerical Nonlinear Programming (3-0-3).
Analysis of modern numerical methods for constrained problems, including variable metric methods, sucessive quadratic programming, and trust region methods. Nor offered every year.

563. Engineering Approach to Mathematical Program (3-0-3).
Minimization of functions of variables which are either unconstrained, or subject to equality constraints, or subject to inequality constraints, or subject to both equality and inequality constraints. Analytical methods: first-order conditions and second-order conditions. Numerical methods: first-order methods and second order methods. Also offered as Mechanical Engineering 563.

564. Engineering Approach to Optimal Control (3-0-3).
Optimal control theory and calculus of variations. Minimization of fuctionals depending on variables subject to differential constraints. Numerical methods; first-order methods and second-order methods. Also offered as Mechanical Engineering 564.

571. Topics in Linear Programming (3-0-3)
Continuation of Mathematical Sciences 471. Advanced topics in mathematical structure of linear programming. Special emphasis on applications in management and economics. Not offered every year.

572. Topics in Theory of Games (3-0-3)
Utility theory; theory of two-person general-sum games; bargaining and threats. Theory of n-person games; solution concepts and extensions. Optional topics. Not offered every year.

573. Nonlinear Programming (3-0-3)
Theory and computational methods for nonlinear programming, including: Kuhn-Tucker conditions, duality theory, methods for constrained optimization of convex and nonconvex problems. Also offered as Economics 573. Not offered every year.

574. Integer Programming (3-0-3)
Applications, theory and computational methods in pure and mixed integer programming. Special problem structures.

581. Mathematical Probability I (3-0-3).
Measure-theoretic foundations of probability for students who need access to advanced mathematical literature in probability and random processes. Open to qualified undergraduates. Prerequisite: Mathematical Sciences 381. Also offered as Statistics 581.

582. Mathematical Probability II (3-0-3)
Continuation of Mathematical Sciences 581. Also offered as Statistics 582.

583. Introduction to Random Processes and Applications (3-0-3).
Formulation, analysis, representations, and applications of some standard random processes. Prerequisite: Mathematical Sciences 381 Recommended: Mathematical Sciences 581 or a course in real variable theory. Also offered as Electrical and Computer Engineering 533 and Statistics 583.

584. Estimation Theory (3-0-3).
Maximum likelihood and Bayesian vector parameter estimation.Minimum mean square error estimation. Time series analysis. Algorithms based on state variable and ARMA models for signal estimation, model identification, and spectral estimation. Prerequisite: Mathematical Sciences 381 (583 recommended). Also offered as Electrical and Computer Engineering 534 and Statistics 584. Not offered every year.

585. Information and Coding Theory (3-0-3).
See Electrical and Computer Engineering 535. Prerequisite: Mathematical Sciences 381. Also offered as Electrical and Computer Engineering 535.

587. Advanced Stochastic Processes (3-0-3)
Measure-theoretic probability. Separability and measurability. Analytic properties of sample functions. Standard properties of second-order processes. Continuous-parameter Markov processes and martingales. Prerequisite: Mathematical Sciences 581 or 583. Also offered as Electrical and Computer Engineering 587. Not offered every year.

590a, 591b. Topics in Operations Research (3-0-3 each semester).

592a, 593b. Topics in Applied Mathematics (3-0-3 each semester).

594a, 595b. Topics in Applied Probability (3-0-3 each semester).

596a, 597b. Special Topics in Mathematical Sciences (3-0-3 each semester). Independent study.

617. Continuum Mechanics I (3-0-3).
Advanced topics in continuum mechanics. Theory of constitutive equations. Theories of fading memory. Thermodynamics of materials with memory. Prerequisite: Mechanical Engineering 511, 512. Also offered as Mechanical Engineering 617. Not offered every year.

618. Continuum Mechanics II (3-0-3).
Recent developments in continuum mechanics. Typical topics: irreversible thermodynamics; electromagnetic interaction with general materials; theories of mixtures, continuum dislocation theories. Prerequisite: Mathematical Sciences 617. Also offered as Mechanical Engineering 618. Offered occasionally.

652. Topics in Numerical Differential Equations (3-0-3).
The content of this course varies from year to year. It may be repeated if the change of content justifies.

654. Topics in Optimization (3-0-3).
Content varies from year to year.

800a,b,c. Thesis (Variable).

Mechanical Engineering and Materials Science

The George R. Brown School of Engineering

Professor J.E. Akin, *Chair*
Professors Brotzen, Chapman, Cheatham, McLellan,
Miele, J.M. Roberts, Spanos, Walker, Wang, and Wierum
Associate Professors Bayazitoglu and Pharr
Assistant Professors Angel and Cohen

Degrees Offered: B.A., B.S.M.E., B.S.M.S., M.M.E., M.M.S., M.S., Ph.D.

Undergraduate Program. Undergraduate programs offered by this Department lead to the degrees of Bachelor of Arts (with a major in mechanical engineering or materials science and engineering), Bachelor of Science in Mechanical Engineering, and Bachelor of Science in Materials Science.

The programs in mechanical engineering may, by proper choice of electives, lead to specialization in one of several options: thermal sciences and energy conversion, gas dynamics, hydrodynamics, stress analysis and mechanical behavior of materials, aerospace engineering, and materials engineering. The programs in materials science and engineering provide the student with knowledge of the fabrication, structure, and properties of materials used by engineers. The B.A. programs are highly flexible, involve less technical content, and allow the student to pursue more deeply areas of interest outside of engineering. The B.S. programs, both accredited by the Accreditation Board for Engineering and Technology, have higher content of technical courses and prepare the student for the professional practice of engineering.

The senior year of the B.S. program in mechanical engineering provides a capstone design experience for mechanical engineering majors. Senior mechanical engineering students are required to complete a major design project in addition to course work in computer-aided design and design applications.

The basic University requirements for the B.A. and B.S. programs are summarized under Degree Requirements and Majors (pp. 54-68) and Engineering and Applied Science (page 186). The detailed requirements are summarized below. Lists of representative courses and their normal sequence during the students'undergraduate years are available from the department for either the B.A. or B.S. programs in both mechanical engineering or materials science and engineering.

Students seeking the B.A. degree with a major in mechanical engineering must satisfy the University distribution requirements while completing not less than 75 semester hours in courses specified by the department and not less than 60 additional semester hours. Those seeking the B.A. degree with a major in materials science must satisfy the University distribution requirements while completing not less than 54 semester hours in courses specified by the department and not less than 75 additional semester hours.

Students seeking the accredited B.S. in Mechanical Engineering must satisfy the University distribution requirements while completing not less than 42 semester hours in courses unspecified by the Department and not less than the 92 semester hours comprised by the following courses.

Mathematics 101, 102, 211, 212
Mathematical Sciences 223, 340
Physics 101, 102, and 132
Chemistry 101, 102, 107
Engineering 200, 211, 241
Materials Science 301, 304
Mechanical Engineering 311, 314, 331, 332, 340, 371, 372, 401, 403, 404, 411, 412, 431, 471, 481
Approved major design elective of three semester hours.

Students seeking the accredited B.S. in Materials Science and Engineering must satisfy the University distribution requirements while completing not less than 47 semester hours in courses unspecified by the Department and not less than the 87 semester hours comprised by the following courses:

Mathematics 101, 102, 211, 212
Physics 101, 102, and 132
Chemistry 101, 102, and 107
Engineering 211, 241
Materials Science 301, 303, 401, 402, 406, 411, 535, and 537
One of the following: Engineering 240, Mathematical Sciences 223, Computer Science 211
One of the following: Mathmatical Sciences 340, 343
One of the following: Materials Science 245, Engineering 200, Chemistry 311
One engineering elective
Additional course requirements for the **Engineering Materials Option:**
Materials Science 404
Two Materials Science electives
One of the following: Materials Science 543, 561, 562
One of the following: Mechanical Engineering 311, Civil Engineering 300
One approved science elective
Additional courses required for the **Electronic Materials Option:**
Electrical Engineering 342, 462
Physics 201
One of the following: Electrical Engineering 459, Physics 311
One Materials Science elective

A suggested sequence in which courses should be taken is available from the Department.

Professional and Graduate Programs. Advanced level programs offered by this department lead to the professional degrees of Master of Mechanical Engineering and Master of Materials Science and to the research degrees of Master of Science and Doctor of Philosophy in either mechanical engineering or materials science.

The professional degrees involve a fifth year of specialized study, integrated with the four prior years leading to either the B.A. or B.S. degrees in the same areas of interest described in the foregoing discussion of the undergraduate programs. The professional programs are open to students who have shown academic excellence in their undergraduate studies. Detailed University requirements for professional degrees are described under Professional Degrees (pp. 106-113) and involve the successful completion of 30 semester hours of course work. Suggested lists of courses are available from the department; however, specific programs are developed for each student according to interest.

The programs leading to the research degrees of M.S. and Ph.D. are open to students who have demonstrated outstanding performance in their undergraduate studies. The general University requirements for these degrees are outlined under Requirements for Research Degrees (pp. 105-106). Specific course requirements are variable, depending on preparation and performance in courses and on qualifying examinations, etc. The granting of a graduate degree presupposes superior quality academic work and a demonstrated ability to do original research. For both the M.S. and Ph.D. degrees, a thesis must be presented that comprises an original contribution to knowledge, and it must be defended in a public oral examination.

The research interests of the faculty and the laboratory equipment available provide the following areas of specialization: (1) engineering mechanics; (2) materials science; (3) fluid dynamics, gas dynamics, heat transfer, physical oceanography; (4) aeroastronautics; (5) computer-aided design; and (6) computational mechanics.

Mechanical Engineering Courses

311a. Mechanics of Deformable Solids (3-0-3).
Analysis of stress and deformation of solids with applications to beams, circular shafts, and columns. Prerequisite: Engineering 211.

Mr. Angel

314b. Introduction to Mechanical Design (3-0-3).
An introductory design course covering the design process, materials selection, and design methods. Prerequisite: Mechanical Engineering 311.

Mr. Sorenson

331a. Junior Laboratory I (0-3-1).
Static and impact testing of engineering materials. Beam deflection and shear center experiments are included. Strain gauges are applied and tested.

Mr. Angel

332b. Junior Laboratory II (0-3-1).
Instruction in fluid mechanics and thermodynamics.

Mr. Wierum

340b,a. Industrial Process Laboratory (0-3-1).
Practical experience in and observation of selected industrial processes. Sign-up in Mechanical Engineering Office. Prerequisite: mechanical engineering major

Mr. Guidry

371a. Fluid Mechanics I (3-0-3).
Introduction to fluid statics and dynamics; the development of the fundamental equations of fluid mechanics and their application to problems of engineering interest. Prerequisite: Engineering 200, 211, Mathematics 212.

Mr. Cohen

372b. Fluid Mechanics II (3-0-3).
Continuation of Mechanical 371 devoted to potential flow, lubrication, boundary layers, and turbulence. Prerequisite: Mechanical Engineering 371.

Mr. Cohen

401a. Mechanical Design Applications (3-0-3).
Prerequisite: Mechanical Engineering 314.

Mr. Cheatham

403a. Computer Aided Design (3-0-3).
Integration of the computer into the area of design. Optimization, simulation, finite elements, expert systems, etc. Prerequisite: Mechanical Engineering 301.

Mr. Akin

404b. Materials Engineering and Design (0-12-4).
Technological aspects of materials selections, design, failure, and analysis. Laboratory time is spent in an industrial setting. Limited to materials science majors except by special arrangement. Prerequisite: Materials Science 301.

406a. Measurement And Control (3-3-4).
Instrumentation methods, analogs, analysis of experimental results, applications in controls. Also offered as Civil Engineering 406.

Mr. Bourland

411a. Analytical Dynamics (3-0-3).
Application of energy methods in the study of particle and rigid-body dynamics, electric circuits, electromechanical systems, and continuous dynamic systems. Prerequisite: Engineering 211.

Mr. Spanos

412b. Vibrations (3-0-3).
Analysis of discrete and continuous linear, mechanical, vibrating systems with particular emphasis upon multi-degree-of-freedom systems. Approximate methods are included. Prerequisite: Mechanical Engineering 411.

Mr. Spanos

431a. Senior Laboratory I (0-3-1).
Instruction in gasdynamics, heat transfer, applied thermodynamics, and engine cycles.

471a. Applications of Thermodynamics (3-0-3).
Applications of thermodynamics to various systems of interest in mechanical engineering with particular attention to energy conversion, refrigeration, and psychrometrics. Prerequisite: Engineering 200.

Mr. Chapman

472a. Thermal Systems Design (3-0-3).
Design and synthesis of systems based on applications of thermodynamics, fluid mechanics, heat transfer, economics, and optimization theories. Prerequisite: Engineering 200, Mechanical Engineering 371, 372, 471, 481.

Mr. Walker

476b. Fluid Machinery (3-0-3).
Continuous-flow machinery analysis and design problems. Prerequisite: Mechanical Engineering 371.

481b. Heat Transfer (4-0-4).
General study of the principles of heat transfer by conduction, convection, and radiation and their application to problems of engineering practice.

Mr. Chapman

496b. Robotics Laboratory (1-0-1).
Computer vision experiments, programming a mobile robot and an industrial-type PUMA robot, operating a CNC mill and an industrial-size CNC lathe, projects.

Mr. Cheatham

498b. Introduction to Robotics (3-0-3).
A survey of topics in robotics including kinematics, dynamics and control theory applied to robotics.

Mr. Cheatham

501a. Analytical Dynamics (3-0-3).
Graduate level version of Mechanical Engineering 411. Offered concurrently with 411.

Mr. Spanos

502b. Vibrations (3-0-3).
Graduate level version of Mechanical Engineering 412. Offered concurrently with Mechanical 412.

Mr. Spanos

509b. Dynamic Analysis of Offshore Structures (3-0-3).
Loads on offshore structures are described on deterministic and probabilistic basis. Methods are examined for calculating the structural response. Specific examples involving drill strings, marine risers, fixed and compliant structures are given. Also listed as Civil Engineering 509.

Mr. Spanos

510b. Elastodynamics (3-0-3).
Propagation of waves in linearly-elastic strings, fluids, and solids. Surface waves, wave reflection and refraction at interfaces. Wave propagation in waveguides. Steady-state and transient half-space problems. Scattering of waves by cracks.

Mr. Angel

511b. Continuum Mechanics I (3-0-3).
Concepts and general principles common to all branches of solid and fluid mechanics. Applications include non-Newtonian fluid mechanics and nonlinear elasticity.

Mr. Angel

515b. Structural Plasticity (3-0-3).
Problems in limit analysis and design; plastic behavior of structures; flexure and torsion of prismatic members. Also offered as Civil Engineering 515.

Mr. Merwin

517b. Finite Element Methods (3-0-3).
Introduction to the finite element analysis with applications to problems in fluid and solid mechanics.

Mr. Akin

521b. Flight Mechanics I (3-0-3).
Introduction to the performance, stability, and control of flight vehicles. Not offered every year.

523b. Probabilistic Structural Dynamics (3-0-3).
Also offered as Civil Engineering 523.

Mr. Lutes

530b. Heat Exchanger Design (3-0-3).
Introduction to the fundamentals of the thermal design of heat exchangers; the design of a heat exchanger for a specified application.

Ms. Bayazitoglu

537a. Introduction to Artificial Intelligence (3-0-3).
See Electrical and Computer Engineering 537.

Mr. Philippe

538b. Expert Systems Applied to Robotics (3-0-3).
Engineering applications of artificial intelligence and expert systems to robotics and automation.

563a. Engineering Approach to Mathematical Programing(3-0-3).
Minimization of functions of variables which are (1) unconstrained, or (2) subject to equality constraints, or (3) subject to inequality constraints, or (4) subject to both equality and inequality constraints. Analytical and numerical methods. Also offered as Mathematical Sciences 563.
Mr. Miele

564b. Optimal Control (3-0-3).
Optimal control theory and calculus of variations. Minimization of functionals depending on variables subject to differential constraints, non-differential constraints, initial constraints, and final constraints. Analytical and numerical methods. Also offered as Mathematical Sciences 564.
Mr. Miele

576b. Propulsion (3-0-3).
Basic principles of gasdynamics, thermodynamics, and chemistry applied to prediction of the behavior of airbreathing and rocket propulsion devices. Not offered every year.

591a. Gas Dynamics (3-0-3).
Fundamentals of compressible, one-dimensional gas flows with area change, normal shocks, friction, and heat addition; oblique shocks and Prandtl-Meyer flows. Prerequisite: Mechanical Engineering 371.

593a,b. Mechanical Engineering Problems (Variable).
With approval, mechanical engineering students may elect an investigation or design project under the direction of a member of the staff.
Mr. Akin

601a,b. Special Topics (Variable).

602b,a. Special Topics (Variable).

603a,b. Special Topics (Variable).
Computer graphics with applications in robotics.
Mr. Cheatham

604a,b. Special Topics (Variable).
Mr. Akin, Mr. Miele

605b,a. Special Topics (Variable).

606a,b. Graduate Seminar (0).
Mr. Akin

673a. Advanced Fluid Mechanics I (3-0-3).
Conservation equations for viscous compressible fluids. Applications to viscous and inviscid flows. Vorticity theorems. Boundary layer flows. Low Reynolds number flows.
Mr. Cohen

676b. Computational Fluid Mechanics (3-0-3).
Numerical methods for the solutions of the equations of fluid mechanics. Finite difference schemes, numerical grid generation, stability considerations. Prerequisite: Mechanical Engineering 673.
Mr. Walker

682a. Convective Heat Transfer (3-0-3).
Rigorous study of the transfer of heat by free and forced convection.
Ms. Bayazitoglu

800a,b. Research and Thesis (Variable).
Mr. Akin

Materials Science Courses

245a. Thermodynamics of Engineering Materials (3-0-3).
Introduction to the kinetics and thermodynamics of engineering materials.

Mr. Brotzen

301b. Materials Science (3-0-3).
Introduction to the science of solid materials covering metals, ceramics, plastics, and semiconductors. The properties of solid materials from atomic and macroscopic points of view. Prerequisite: Mathematics 101.

Mr. Brotzen

303b. Materials Science Junior Laboratory (0-3-1).
Introductory laboratory course. Open to junior materials majors.

Mr. Cunningham

304a. Applied Materials Engineering (0-3-1).
Practical application of the basic principles of materials science, covering case studies of failures under a variety of conditions and topics in the fabrication and heat treatment of metallic materials. Prerequisite or corequisite: Material Science 301.

Mr. Cunningham

401a. Thermodynamics in Alloys (3-0-3).
Thermodynamics applied to systems of solid solutions and intermetallic compounds. Phase law and phase equilibrium. Determining free energies in binary systems. Simple models for transformations.

Mr. McLellan

402a. Mechanical Properties of Materials (3-0-3).
Basic, fundamental properties of dislocations in crystals. Applications to mechanical behavior: creep, work hardening, internal friction, fracture, and other structure sensitive phenomena of materials. Prerequisite: Mathematics 211.

Mr. Cunningham

404b. Materials Engineering and Design (2-3-3).
Technological aspects of materials selection, design, failure, and analysis. Laboratory time is spent in an industrial setting. Prerequisite: Materials Science 395.

Mr. Cunningham

406b. Physical Properties of Solids (3-0-3).
Survey of electrical, magnetic, and optical properties of metals, semiconductors, and dielectrics based upon elementary band theory concepts. Prerequisite: Mathematics 211.

Mr. Brotzen

411b. Metallography and Phase Relations (3-0-3).
Microstructures which may be observed in metals and alloys; optical metallography in addition to more sophisticated techniques. Prerequisite: Materials Science 395.

Mr. McLellan

415b. Ceramics and Glasses (3-0-3).
Fundamentals of ceramic and glassy materials, including phase relations, theoretical properties, structure, and bonding. Not offered every year. Prerequisite: Materials Science 395. (Course not listed.)

Mr. Roberts

501a,b. Materials Science Seminar (0).
A series of biweekly seminars on selected topics in Materials Science.

535a. Introduction to X-Ray Diffraction and Electron Microscropy(3-0-3).
Study of crystals by X-ray and electron diffraction and electron microscopy. Basic diffraction theory and methods for characterization of structure and constitution of materials. Prerequisite: Mathematics 101.

Mr. Roberts

537a. X-Ray Diffraction and Electron Microscopy Laboratory (0-3-1).
Selected laboratory experiments to complement the lecture material of Materials Science 535.

Mr. Roberts

541b. Physical Metallurgy (3-0-3).
Fundamentals of solidification, alloying, and heat treatment. The mechanical and nonmechanical properties of metallic systems from atomic and electronic theory. Prerequisite: Materials Science 395.

561a. Advanced Metallurgical Laboratory I (0-4-1).
Students whose interest lies primarily in the field of materials and metallurgy are given the opportunity for research in these fields. Prerequisite: permission of instructor.

562b. Advanced Metallurgical Laboratory II (0-4-1).
Students whose interest lies primarily in the field of materials and metallurgy are given the opportunity for research in these fields. Prerequisite: permission of instructor.

566b. Crystalline Solids (3-0-3).
Also offered as Electrical and Computer Engineering 566 and Physics 566.

593a. Polymers (3-0-3).

Mr. Armeniades

594b. Properties of Polymers (3-0-3).
Basic concepts in macromolecular chemistry and physics and their application in the production, processing, and use of synthetic polymers. Also offered as Chemical Engineering 594.

Mr. Armeniades

610a. Crystal Thermodynamics (3-0-3).
Potentials and third-order elastic constants will be discussed. The lattice dynamics of harmonic phonons and anharmonic perturbation expansion are included, as well as the contribution of electrons to the thermodynamic quantities.

Mr. Brotzen

614a,b. Special Topics (3-0-3).

615a,b. Special Topics (Variable).

Mr. Brotzen

634a. Thermodynamics of Alloys (3-0-3).
Relations between classical thermodynamics and statistical mechanics applied to understanding solid and liquid alloys. Solid-solid, liquid-solid, and gas-solid equilibria in metallurgy.

Mr. McLellan

635b. Transformation in Alloys (3-0-3).
Diffusion in metals and alloys. Mechanism and phenomenology of diffusion-controlled transformations. Precipitation from saturated alloys and liquid solutions. Transformations in heat treated alloys.

Mr. McLellan

English

Professor Isle, *Chair*
Professors Apple, Chance, Doody, Doughtie, Grob, Huston, Meixner, Morris, Patten, Piper, Skura, Snow, Spears, and J.A. Ward
Associate Professor Driskill
Assistant Professors R. Jones, Lurie, Newfield, and S. Wood
Lecturers Stout and Tobin

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. A major in English requires 36 semester hours in English; at least 24 semester hours must be courses at or above the 300 level. A double major requires 30 semester hours in English, with at least 18 hours at the advanced level. All English majors must take Masters of English Literature (English 251, 252) as a preparatory survey.

An English major must also take advanced courses in the following categories: (1) six semester hours in English literature before 1800, of which one course must be Chaucer, Shakespeare, or Milton; (2) three semester hours in English literature after 1800; (3) three semester hours in American literature.

It is recommended that all English majors take some formal instruction in English and American history and, if they plan to do graduate work, at least six semester hours at the advanced level in a foreign language.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

The Graduate Program. The graduate program in English is designed for thorough training of a limited number of carefully selected students. Both the M.A. and Ph.D. degrees are offered to students interested in all fields of British and American literature and in literary theory.

As a part of their training, all graduate students are expected to serve as research assistants, to participate in the teaching activities of the department, or to assist the editor of *Studies in English Literature,* published by Rice University.

Within the limits of available funds, graduate scholarships and fellowships are awarded to qualified students. Scholarships provide a waiver of tuition; fellowships include a stipend and a waiver of tuition.

Requirements for the Degree of Master of Arts. Students admitted to the graduate program may take the master's degree by meeting four requirements:

1. If they have not done so before entering the program, they must satisfactorily complete at least 3 semester hours at the junior or senior level in the literature of a foreign language, not in translation, either at Rice or another accredited institution.
2. They must satisfactorily complete at least 30 semester hours of graduate work in English, including six hours credit for the thesis.
3. They must pass two three-hour qualifying examinations covering two of the following fields: British literature to 1660; British literature, 1660-1900; and American literature to the present and British literature, 1900 to the present. These examinations may both be taken in the first year; at least one of them must be taken no later than the beginning of the student's third semester in the graduate program.

4. They must complete a thesis of approximately 50 pages and must defend it in an oral examination. For students admitted to candidacy for the Ph.D. degree, the requirement of a thesis will be waived.

Requirements for the Degree of Doctor of Philosophy. Candidates for the doctoral degree must complete five requirements:

1. If they have not done so before entering the program, they must satisfactorily complete at least six semester hours at the junior or senior level in the literature of a foreign language, not in translation. Although this work may be done at Rice or another accredited institution, it should directly relate to the student's research interests, and it must be approved by the Graduate Studies Committee.
2. They must satisfactorily complete at least 42 semester hours of course work in English,exclusive of the thesis.
3. They must satisfactorily complete a set of qualifying examinations, which consists of three three-hour written examinations covering the following periods: (1) British literature to 1660; (2) British literature, 1660-1900; and (3) American literature to the present and British literature, 1900 to the present. Although the timing and order of these examinations may vary, at least one of them must be taken by the beginning of a student's third semester in the graduate program; and it is expected that all three will be completed by the beginning of a student's fifth semester.
4. They must satisfactorily complete a preliminary examination, which consists of a 6-hour written examination covering two chronologically contiguous fields of specialization chosen by the student from the following: (1) Old English; (2) Middle English; (3) Sixteenth Century including Shakespeare, Seventeenth Century including Shakespeare and Milton; (5) Restoration including Milton, Dryden, and Swift; (6) Eighteenth Century including Swift and Blake; (7) Romantic including Blake; (8) Victorian; (9) Modern British including T.S. Eliot; (10) American literature from colonial to Henry James, inclusive; (11) Modern American including Henry James and T. S. Eliot; (12) Literary Theory: Plato to 1800; (13)Literary Theory: 1800 to present. This examination will usually be taken at the end of the second semester following completion of the qualifying examination. The examining committee may request a 1-hour oral examination focusing on the written examination.
5. They must complete a dissertation which demonstrates a capacity for independent work of high quality in either traditional scholarship, critical interpretation, or critical theory; and they must pass an oral examination on the thesis and related fields.

In order to qualify for continuing financial aid, students must be approved for candidacy for the Ph.D. by the beginning of the seventh semester at Rice. To secure approval, they must satisfy the foreign language requirement, pass both the qualifying and the preliminary examinations, and have a dissertation prospectus approved by the department's graduate studies committee.

English Courses

101a. Critical Reading and Writing (3-0-3).
Analysis and discussion of literary texts: poetry, drama, prose, fiction. Students submit essays frequently.
Staff

102b. Critical Reading and Writing (3-0-3).
Continuation of Engl 101, with sections giving special emphasis to individual genres: fiction, drama, and poetry.

Staff

103a. Basic Composition (3-0-3).
Intended primarily for students whose English Competency Examination is below standard. Prerequisite: permission of instructor.

Ms. Tobin and Ms. Driskill

104b. Basic Composition (3-0-3).
See English 103. Permission of instructor is required.

Ms. Tobin and Ms. Driskill

212b. Introduction to Creative Writing (3-0-3)

Ms. Wood

251a. Chaucer to 1800 (3-0-3).
Readings in British major authors of the Middle Ages, the Renaissance, and the eighteenth century. Required of English majors. Enrollment in each section limited. Turn in preference sheet to English Office.

Mr. Piper, Mr. Huston, Ms. Skura

252b. Major British Writers: 1800 to Present (3-0-3).
Readings in major British authors of the nineteenth and twentieth centuries. Required of English majors. Enrollment in each section limited. Turn in preference sheet to English Office.

Mr. Doody, Mr. Grob, Mr. Morris

271a. Aspects of Modern Literature (3-0-3).
Modern literature in short story, drama, poetry, novel, and nonfiction, drawn from American, British, and European sources of the ninteenth and twentieth centuries.

Mr. Ward

272b. Aspects of Modern Literature (3-0-3).
See English 271.

Staff

302a. Ballad and Folksong (3-0-3).
About two-thirds of this course is devoted to British and American folk ballads; the rest surveys American folk lyrics, spirituals,work songs, and blues.

Mr. Doughtie

303b. Afro-American Literature (3-0-3).
A survey of major literary works by Afro-Americans.

Staff

304b. Twentieth-Century Women Writers (3-0-3).
Readings in Woolf, Cather, Porter, Lessing, Plath, Leverton, Rich, and others.

Ms. Lurie

305a. Introduction to Women's Studies in Literature(3-0-3).

Ms. Lurie

311a. Fiction Writing (3-0-3).
Discussion and analysis of student fiction. Prerequisite: permission of instructor.

Ms. Lowry

312b. Fiction Writing (3-0-3).
See English 311.

Mr. Abbott

313b. Dramatic Writing (3-0-3).
The emphasis, depending on individual students, will be on the writing of drama in one of several of the chief modes of the performing arts: plays, films, musicals, opera, even dance. Prerequisite: permission of instructor required.

Mr. Meixner

314a,b. Poetry Writing (3-0-3).
Extensive reading in modern poetry as well as regular practice in the writing of various forms will be required. Prerequisite: permission of instructor.

Ms. Wood

316a. Writing in the Social Sciences (3-0-3).

Ms. Driskill

317b. Technical Writing (3-0-3).

Ms. Driskill

323a. Chaucer (3-0-3).
Readings in the Canterbury Tales and other writings of Chaucer.

Staff

334b. Elizabethan and Jacobean Drama (3-0-3).
Close critical reading of Elizabethan and Jacobean plays with particular emphasis on the works of Marlowe and Jonson.

Ms. Skura

339a. Shakespeare (3-0-3).
Each semester representative plays including tragedies, comedies, histories, and romances will be read.

Mr. Grob

340b. Shakespeare (3-0-3).
See English 339.

Mr. Huston

343a. Seventeenth Century British Literature (3-0-3).
Poetry and prose of the seventeenth century, excluding Milton.

Mr. Snow

351b. British Literature of the Romantic Period(3-0-3).
The major writings of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats.

Mr. Grob

361a. Eighteenth-Century British Fiction (3-0-3).
A course dealing chiefly in the novels of Fielding, Stern, Smollett, and Austen.

Mr. Piper

363b. Twentieth-Century British Fiction (3-0-3).
Forster, Woolf, Lawrence, Joyce, and their contemporaries. Particular attention will be given to *Ulysses*.

Mr. Meixner

367a. Modern Drama: Ibsen to 1940 (3-0-3).
Plays by Ibsen, Chekhov, Strindberg, Wilde, Shaw, Synge, O'Casey, Pirandello, and T.S. Eliot.

Mr. Meixner

368b. Modern Drama: 1940 to the Present (3-0-3).
O'Neill, Miller, and Williams; French moderns; absurdism and recent trends.

Mr. Isle

370b. The Novel in the Twentieth Century (3-0-3).
Major European and Latin American fiction of the twentieth century in translation.
Staff

378a. American Literature to 1860 (3-0-3).
Poe, Emerson, Thoreau, Melville, Hawthorne, Whitman, and other American writers.
Mr. Newfield

379b. American Literature: 1860-1910 (3-0-3).
A study of Mark Twain, Emily Dickinson, Stephen Crane, Henry James, and others.
Mr. Ward

383b. American Fiction: 1910-40 (3-0-3).
Hemingway, Fitzgerald, Faulkner, and their contemporaries.
Mr. Doody

384a. American Fiction: 1940 to the Present (3-0-3).
Survey with emphasis on the work of Bellow, Mailer, Barth, and Pynchon.
Mr. Isle

387b. Twentieth-Century American Poetry (3-0-3).
Frost, Pound, Eliot, and Stevens with some attention to the other poets of the twentieth century.
Ms. Lurie

394a. Structure of English Language (3-0-3).
Also offered as Linguistics 394.
Mr. Davis

395b. History of English Language (3-0-3).
Also offered as Linguistics 395.
Mr. Mitchell

400a. Literary Criticism: Theory (3-0-3).
Recent developments in critical theory.
Mr. Morris

401b. Topics in Literature: Dante (3-0-3).
Ms. Chance

402b. Topics in Literature: Literature and the Visual Arts (3-0-3).
Mr. Snow

403a. Studies in a Major British Author: Shakespeare's Elizabethan and Jacobean Contexts (3-0-3).
Ms. Skura

407a. Studies in a Literary Type: The Novel and Narrative Theory (3-0-3).
Mr. Doody

416a,b. Advanced Creative Writing: (3-0-3).
Prerequisite: permission of instructor required.
Ms. Lowry, Mr. Abbott

421a. Directed Reading (3-0-3).
Mr. Isle

422b. Directed Reading (3-0-3).
Mr. Isle

423a. Senior Thesis (3-0-3).
Mr. Isle

424b. Senior Thesis (3-0-3).

Mr. Isle

501a. British and American Literature (Variable).
Directed reading in a topic in British or American literature or literary theory. Graduate students may enroll for up to two semesters of directed reading for graduate credit.

Mr. Isle

502b. British and American Literature (Variable).
See English 501.

Mr. Isle

504b. Twentieth-Century Women Writers (3-0-3).
An enriched version for graduate students of English 304. Additional readings, papers, or meetings to be assigned by the instructor.

Ms. Lurie

510a. Graduate Seminar: Deconstruction (3-0-3).
Open to undergraduates by permission of the instructor. Also offered as French 503.

Ms. Gallop

511b. Graduate Seminar: Henry James (3-0-3).
Open to undergraduates by permission of instructor.

Mr. Ward

512a. Graduate Seminar: Arnold and Hardy

Mr. Grob

512b. Graduate Seminar: Faulkner Criticism (3-0-3).

Mr. Morris

513b. Graduate Seminar: Approaches to Teaching Writing (3-0-3).

Ms. Driskill

523a. Chaucer (3-0-3).

Ms. Chance

539a. Shakespeare (3-0-3).
An enriched version for graduate students of English 339, 340. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Grob

540b. Shakespeare (3-0-3).
See English 539.

Mr. Huston

543b. Seventeenth-Century Literature (3-0-3).
An enriched version for graduate students of English 343. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Snow

551b. British Literature, Romantic Period (3-0-3).
An enriched version for graduate students of English 351. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Grob

561a. Eighteenth-Century British Fiction (3-0-3).
An enriched version for graduate students of English 361. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Piper

563b. Twentieth-Century British Fiction (3-0-3).
An enriched version for graduate students of English 363. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Meixner

567a. Modern Drama: Ibsen To 1940 (3-0-3).
An enriched version for graduate students of English 367. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Meixner

568b. Modern Drama: 1940 to Present (3-0-3).

Mr. Isle

578a. American Literature to 1860 (3-0-3).
An enriched version for graduate students of Engl 378. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Newfield

579b. American Literature 1860-1910 (3-0-3).
An enriched version for graduate students of English 379. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Ward

583b. American Fiction: 1910-1940 (3-0-3).
An enriched version for graduate students of English 383. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Doody

584a. American Fiction 1940-Present (3-0-3).
An enriched version for graduate students of English 384. Additional readings, papers, or meetings to be assigned by the instructor.

Mr. Isle

587b. Twentieth-Century American Poetry (3-0-3).
An enriched version for graduate students of English 387. Additional readings, papers, or meetings to be assigned by the instructor.

Ms. Lurie

621a. Directed Reading (3-0-3).

Mr. Isle

622b. Directed Reading (3-0-3).

Mr. Isle

701a. British and American Literature (Variable).
Topics in British and American Literature or Literary Theory.

Mr. Isle

702b. British and American Literature (Variable).

Mr. Isle

703a. Research Leading to Candidacy (Variable).
Topics in British and American Literary theory. To be taken after a student has completed departmental course requirements for the master's or doctorate, and before being admitted to candidacy.

Mr. Isle

704b. Research Leading to Candidacy (Variable).

Mr. Isle

800b,a. Ph.D. Research and Thesis (Variable).
To be taken after a student has been admitted to candidacy.

Mr. Isle

French and Italian

Associate Professor D. Nelson, *Chairman*
Professors Alcover, Brady, Carrington, and Raaphorst
Associate Professors Aresu, Konrad, and Logan
Assistant Professor Farrell
Lecturer Caflisch

Degrees Offered: B.A., M.A., Ph.D.

French

Undergraduates may major in French, and there is a graduate program in French leading to the degrees of Master of Arts and Doctor of Philosophy. A fully equipped language laboratory is in operation, and laboratory work is an important part of the elementary courses in French.

Undergraduate Program. A minimum of 30 semester hours (ten courses) in advanced French courses is required for the major in French. However, only 24 semester hours (eight courses) of advanced study are required for double majors or area majors. The following courses are required unless the student is exempted by his or her major adviser: French 301, 302, 311, and 312. Students who have taken French 300- and 400-level courses cannot enroll simultaneously or afterwards in French 200-level courses for credit. Students with a diploma from French-speaking institutions must consult with the department before enrolling in courses.

Students are urged to take some work in European history, English, another European literature, or other courses closely related to French literature and culture. All majors and prospective majors must have their programs approved by the undergraduate adviser.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

In addition to courses at the 100 and 200 levels, the department particularly recommends French 304 and 306 to meet the university distribution requirements. These courses, designed to interest a wide range of students, are taught in English and do not require previous knowledge of French. They may be accepted for an area major when approved by the departments involved.

An honors program in French is available to qualified students. For detailed information, they should consult their French instructor or the departmental adviser. The Clyde Ferguson Bull Traveling Fellowship is awarded each year to a graduating senior with a major or double major in French. The fellowship permits the recipient to spend an entire year in France. A $2,000 summer travel scholarship is presented each year by the Alliance Francaise for university students in the Houston area. Members of the department are available for discussion of the numerous programs of study and travel in France sponsored by both American and French institutions. There is an active chapter of the French honorary society of Pi Delta Phi and an active French club, Le Club des Hiboux.

Graduate Programs. Admission to graduate study in French will be granted to a limited number of qualified students. A distinguished undergraduate record in the study of French literature and a capacity for independent work are essential. The award of advanced degrees is not based solely on accumulation of credits or compliance with formal requirements. Candidates are expected to attain a wide general knowledge of the appropriate history and literature and to demonstrate their command of the French language. In most cases, two years will be required for the completion of work for the degree of Master of Arts. All courses are given in French.

Requirements for the Degree of Master of Arts:

1. Completion with satisfactory standing of 24 hours (beyond B.A.) in advanced courses plus thesis work (6 semester hours).
2. Satisfactory performance on a reading examination in one language other than French (language to be approved by the department).
3. Satisfactory performance on preliminary written and oral examinations in French on the French authors indicated in a reading list provided.
4. Completion of an acceptable thesis.
5. Satisfactory performance on a final oral examination.

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the department. Normally, this will include 54 semester hours of course work plus 36 hours for the thesis. For those already holding the degree of Master of Arts, the requirement would be 30 semester hours of course work plus 36 hours for the thesis.
2. Satisfactory performance on a reading examination in two languages other than French approved by the department.
3. Satisfactory performance on a preliminary written and oral examination on the authors indicated in a reading list provided and on the literature, culture, and civilization of France. The oral examination may be taken only after the successful completion of the written examination. Students have a choice between passing a preliminary examination in a second field of literature or taking at least one course in a closely related field approved by the graduate faculty. Maximum credit toward the Ph.D. degree for work in a "minor" field is limited to three hours.
   Note: Requirements 2 and 3 must be fulfilled one year before the submission of a dissertation.
4. Completion of a dissertation approved by the department; the dissertation is expected to represent an original contribution.
5. Satisfactory performance on a final oral examination on the dissertation and related fields.
   Note: Regardless of the type of appointment held by the graduate student, he or she may be required to undertake research or teaching assignments, depending upon the background of the graduate student and the needs of the department.

French Courses

101a,b. Elementary French I (3-1-4).
Introductory French. Concentration on all four language skills. Supplemented by work in the language laboratory.

Staff

102a,b. Elementary French II (3-1-4).
See French 101.

Staff

103a. Accelerated Elementary French (6-2-8).
Accelerated review of French for those wishing to enter French 201 in the spring semester. Equivalent to French 101, 102.

Staff

201a,b. Intermediate French I (3-0-3).
Intense oral and written grammar review; literary and cultural readings serve as basis for class discussions and compositions. Prerequisite: French 102 for 201 and 201 for 202, or placement exam.

Staff

202a,b. Intermediate French II (3-0-3).
See French 201.

Staff

301b,a. Advanced French Grammar (3-0-3).
Intensive study of French grammar and syntax at the advanced level, with concentration on idiomatic structures for the language and written practice of contemporary French. Required for French majors. Prerequisite: French 202, 203 or placement exam.

Staff

302a,b. French Phonetics (3-0-3).
Contrastive analysis of the French sound system, including such key areas as diction and articulation of French speech, with emphasis on class as well as laboratory practice. Required for French majors. Prerequisite: French 202, 203 or placement exam.

Ms. Alcover, Ms. Farrell

303b. Advanced Conversation and Composition (3-0-3).
Active practice of composition, oral analysis, and discussion based upon the reading of texts on selected issues and problems in contemporary French society. Prerequisite: French 301 and 302 or placement exam.

Mr. Brady

306b. Structures of Alienation: the Twentieth-Century French and World Novel in English (3-0-3).
Beginning, ending, and meaning in contemporary fiction: the relationship between form and alienation in texts from such authors as Proust, Kafka, Gide, Hesse, Faulkner, Malraux, Camus, Patrick White, and John Fowles.

Mr. Brady

311a. Introduction to French Literature I (3-0-3).
Main currents in French literature from its beginning to the nineteenth century. Required for French majors. Lectures and discussions in French. Prerequisite: French 202, 203, or placement exam.

Ms. Nelson

312b. Introduction to French Literature II (3-0-3).
Main currents in French literature from the nineteenth century to the present. Required for French majors. Open to first-year students. Lectures and discussions in French. Prerequisite: French 202, 203, or placement exam.

Ms. Raaphorst

401a. Syntax and Translation (3-0-3).
Close grammatical and stylistic analysis of passages for translation from English to French and to a lesser extent from French to English. This course is less theoretical than practical, with continual exercise in the art of translation and of writing good French. Prerequisite: French 301 and 302 or placement exam.

Mr. Brady

403a,b. Special Topics (3-0-3).
Not offered every year.

430a. Seventeenth-Century Theater (3-0-3).
Close readings of the plays of Corneille, Moliere, Racine and Regnard. Prerequisite: normally French 301 and 311 or placement exam.
Ms. Alcover

440b. Eighteenth-Century Literature (3-0-3).
This course will include such authors as Montesquieu, Voltaire, Marivaux, Diderot, Rousseau, and Beaumarchais. Prerequisite: normally 301 and 311 or placement exam.
Ms. Alcover

501a,b. Graduate Research (Variable).
Graduate research and thesis in partial fulfillment of the requirements for the degree of Master of Arts.

503a. Special Topics in French Literature (3-0-3).
Seminar on Deconstruction. French majors will read texts in French. Also offered as English 510.
Ms. Gallop

504a. History and Stylistics of the French Language: (3-0-3).
Phonology and syntax of Old French. Selected readings from the lais of Marie de France.
Ms. Nelson

521b. Seminar on Renaissance Poetry (3-0-3).
Poetic theory from 1548 to 1600.
Mr. Carrington

530b. Seminar in Seventeenth-Century Literature (3-0-3).
Ms. Farrell

555a. Seminar on Romanticism (3-0-3).
From Romanticism through Realism to Naturalism in such authors as Constant, Stendhal, Hugo, Balzac, Flaubert, and Zola.
Mr. Brady

562a. Seminar on Modern Drama (3-0-3).
Plays by such authors as George Sand, Simone de Beauvior, Marguerite Yourcenar, Nathalie Sarraute and Marguerite Duras. The aim is to analyze aspects that reflect a specifically female view and so differ from the dominant male tradition of dramatic literature.
Ms. Konrad

566b. Seminar in Contemporary Fiction (3-0-3).
Mr. Aresu

800a,b. Thesis Research (Variable).

Italian

Italian Courses

101a. Elementary Italian I (4-0-4).
Concentration on all four language skills. Basic elements of Italian culture and civilization. This course also includes a "BBC" video program. Language laboratory work required.
Ms. Caflisch

102b. Elementary Italian II (4-0-4).
Concentration on all four language skills. Basic elements of Italian culture and civilization. This course includes a "BBC" video program. Language laboratory work required.
Ms. Caflisch

201a. Intermediate Italian I (3-0-3).
Intense oral and written grammar review. Introduction to the culture and civilization of Italy. Reading of modern prose; composition; class discussion on related materials. This course also includes a "BBC" video program.

Ms. Caflisch

202b. Intermediate Italian II (3-0-3).
Intense oral and written grammar review. Introduction to the culture and civilization of Italy. Reading of modern prose; composition; class discussion on related materials. This course also includes a "BBC" video program.

Ms. Caflisch

Geology and Geophysics

Professor Avé Lallemant, *Chair*
Professors Anderson, D.R. Baker, Bally, De Bremaecker, Heymann, Leeman*(on leave 1988)*, Stormer, Talwani, and Vail
Adjunct Professors Buffler, Burke, D. M. Curtis, Edwards, England, Seriff, Watkins, and J. L. Wilson
Associate Professors H.C. Clark, Dunbar *(on leave 1988)* and Oldow
Adjunct Associate Professors Dravis and Schwarzer
Assistant Professors Droxler and Levander
Adjunct Assistant Professors Riese and Sullivan

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program in Geology. The following courses are required for completion of the degree of Bachelor of Arts with a major in geology:
Geology 101, 102, 311, 312, 331, 332, 334, 361, 390, and 402.
At least six semester hours of geology in additional courses at the 300-level or higher.

The following supporting courses are also required:
Mathematics 101, 102, and 211;
Chemistry 101, 102, and 107;
Physics 101, 102, 132;
Computer Science 211 or Engineering 240.

Double majors including geology must comply with the above requirements except that the two geology electives may be deleted.

Students in the geology major must satisfy the distribution requirements and complete no fewer than 60 semester hours outside the Department for a total of 135 semester hours.

The Department of Geology offers an approved curriculum leading to certification in earth science as a second teaching field. The curriculum consists of 25 semester hours of introductory courses which would most benefit a secondary school teacher, i.e., physical and historical geology, study of minerals, rocks, and fossils; some work in astronomy, meteorology, and oceanography.

Undergraduate Program in Geophysics. The following courses are required for completion of the degree of Bachelor of Arts with a major in geophysics:
Geology 101, 102, 311, 331, 334, 361, 390, 441, 442, and 461;
Mathematics 101, 102, 211, and 212;
Chemistry 101, 102, and 107;

Physics 101, 102, 132, 201, and 231;
Computer Science 211 (or Engineering 240).

Additional courses recommended but not required are Physics 301 and Mathematical Sciences 310 or Mathematics 355 and Mathematical Sciences 340.

Students in the geophysics major must satisfy the distribution requirements and complete no fewer than 60 semester hours outside the Department for a total of 135 semester hours.

Graduate Program. Graduate work is conducted in those specialties that are compatible with the equipment available and with the interests of the staff. At present, the department is prepared to offer advanced work in stratigraphy, sedimentation, sedimentary petrology, igneous petrology, geochemistry, structural geology, regional tectonics, rock mechanics, reflection seismology, and geodynamics. Graduate work is oriented toward the fundamental aspects of the subject rather than directly toward its many applied aspects.

Requirements for Advanced Degrees:

1. Completion of a program of courses equivalent to that for the undergraduate major in geology or geophysics at Rice. This may be completed while in residence at Rice if it has not been done before entering.
2. Completion at a high level of an approved program. All students must take Geology 403, which is the only required course. All students, regardless of the degree with which they enter, must earn a total of 20 credit hours in courses other than research courses. During the second semester of the first year of residence, all students must register for the preparation of a thesis proposal.
3. Satisfactory performance on a written qualifying exam.
4. Passage of an oral exam structured around the thesis proposal. This will be taken before research has begun.
5. Completion for publication of a thesis which represents an original contribution to science plus an oral defense of the research work and of the conclusions of the thesis.
6. Regardless of the type of graduate appointment, satisfactory performance in a limited amount of teaching assistance in undergraduate courses.
7. Additional details are in the departmental guidelines which are distributed to all incoming students.

Fellowships and/or tuition scholarships for incoming students are available which do not obligate work on a specific research project. During their first academic year they decide on a project and an advisor and are then supported by external funds.

Most graduate students can expect to spend two years beyond the bachelor's degree in order to complete requirements for the master's degree and at least an additional two years for the doctoral degree. Some students of very high ability may be allowed to bypass the M.A. and work directly for the Ph.D.

Geology Courses

101a. The Earth (3-3-4).
Nature of the earth and the processes that change it. Laboratory includes the study of rocks, minerals, geological maps, and air photos. Also offered as Geography 101.
Mr. Heymann, Mr. Talwani, Mr. Avé Lallemant, Mr. Droxler

102b. Stratigraphy and Historical Geology (3-3-4).
Fundamentals of physical and paleontological stratigraphy; sedimentation as it relates to stratigraphy, outcrop, well log and seismic stratigraphy, and a summary of historical geology. Also offered as Geography 102.
Mr. Vail

311a. Mineralogy (3-6-5).
Basic introduction to crystallography, crystal chemistry, systematics and classification, physical and chemical properties, distribution, occurrence and genesis of minerals, and optical mineralogy.
Mr. Stormer, Ms. Sisson

312b. Petrology (3-3-4).
Description and interpretation of igneous and metamorphic rocks. Laboratory work emphasizes study of rock thin sections with petrographic microscope.
Mr. Baker

321a. Environmental Geology (3-0-3).
Study of evolutionary mechanisms by which life has adjusted to terrestrial conditions and industrial impacts on these adjustments. For nonmajors only. Enrollment limited. Also offered as Environmental Science and Engineering 321.
Mr. Adams

322b. Mineral Resources and Resource Recovery (3-0-3).
Study of geologic, legal, economic, and political interrelationships that create the energy and material mixes with special reference to the options for national self-sufficency and long term steady state. Enrollment limited. For nonmajors only.
Mr. Adams

331a. Structural Geology (3-3-4).
Introduction to deformation mechanics, structural analysis of faults and folds, and elementary tectonics. Laboratory emphasizes practical use of structural analysis.
Mr. Oldow, Mr. Avé Lallemant

332b. Sedimentology (3-3-4).
Processes in sedimentation and sedimentary rocks including both clastic and carbonate rocks.
Mr. Anderson, Mr. Droxler, Mr. Dunbar

333a. Structural Geology (3-3-4).
Same course as Geology 331 without the laboratory. For nonmajors only.
Mr. Oldow, Mr. Avé Lallemant

334b. Field Mapping Techniques (0-6-2).
Beginning field techniques taught in seven labs and seven field days plus class meetings. Geologic map and report to be submitted.
Mr. Oldow, Mr. Avé Lallemant

341a. The Oceans (3-0-3).
Introduction to science of oceanography; survey of the geological, physical, and biological aspects. Mainly for nonscience majors.
Mr. Anderson, Mr. Droxler, Mr. Dunbar

352b. Engineering Geology (3-0-3).
Analysis, in terms of engineering and environmental applications, of earthquakes, faults, landslides, shorelines, ground water, subsidence, and other geologic phenomena. Techniques of engineering geology investigation.
Mr. Clark

361a. Geophysics (3-3-4).
Description and analysis of gravity, magnetic, thermal, and seismic properties of the earth and their bearing on plate tectonics. Prerequisite: Mathematics 211, Engineering 240 or equivalent.
Mr. De Bremaecker

390c. Field Geology (0-12-4).
A six-week field course in geology.

402a. Paleontology (2-6-4).
Introduction to the taxonomy, systematics, morphology, ecology, paleoecology and correlation of fossils. Aspects of advanced historical geology will also be covered.
Mr. Anderson, Mr. Droxler

403a. Advanced Physical Geology (1-0-0).
Introduction to current research in geology. Each faculty member in department participates by describing his research and some of the techniques involved.

404a. Micropaleontology (2-6-4).
Study of microfossils; emphasis on identification, ecology, paleoecology, and biostratigraphy of radiolaria and foraminiferia. Prerequisite: Geology 402 or permission of department. Not offered 1987-88.

411a. Metamorphic Petrology (3-3-4).
Evaluation of sub-solidus mineral equilibria through consideration of natural assemblages, thermodynamic calculations, and experiments. Labs will stress thin section petrography.
Ms. Sisson

412b. Igneous Petrology (3-3-4).
Evaluation of the evolution of igneous rocks in the earth's crust and mantle. Topics will include phase equilibria, experimental studies and geochemistry. Labs will stress thin section petrography.
Mr. Stormer

415a. Economic Geology—Petroleum (3-0-3).
A study of the geology of petroleum: origin, migration, and accumulation will be studied. Government regulation and industry economics will be examined.
Mr. Riese, Mr. Bally

416b. Economic Geology—Mineral Deposits (3-0-3).
An overview of metallic and non-metallic mineral deposits, theories of their origin, and classification. The impact of government regulation, economics, production practices, and exploration will be considered.
Mr. Riese

418b. Geological Oceanography (3-3-4).
Study of geological aspects of oceanography, including geomorphology, nearshore processes, seafloor spreading, plate tectonics, marine geophysics, marine sediments, and paleoceanography. Not offered 1987-88.
Mr. Anderson, Mr. Dunbar, Mr. Droxler

421a. Deep Sea Sedimentology/Paleoceanography (3-0-3).
Study of the Mesozoic and Cenozoic evolution of the ocean system based on the analyses of biogenic and terrigenous deep sea sediments. Prerequisite: Geology 332 or 341.
Mr. Droxler

422b. Exploration Geophysics (3-0-3).
Basic principles and procedures involved in geophysical exploration. Emphasis is on reflection seismology involving acquisition, processing, and interpretation of data. For nonmajors only. Prerequisite: Mathematics 212.
Mr. Seriff, Mr. Clark, Mr. Gibson

423b. Antarctic Marine Geology (3-0-3).
The study of marine geologic principles and processes using examples from the Southern Oceans.
Mr. Anderson

427a. Sequence Stratigraphy (3-0-3).
Fundamental principals of sequence stratigraphy (a new tool used to subdivide, correlate, and map sedimentary rocks within chronostratigraphically constrained genetic intervals) and its application to outcrop, well log, and seismic data.
Mr. Vail

428b. Geologic Interpretation of Seismic Reflection Profiles (3-3-4).
Discussion and application of seismic stratigraphic and structural interpretation procedures, including the integration of surface and subsurface data with seismic reflection profiles.
Mr. Bally, Mr. Vail

441a. Geophysical Data Analysis (2-2-3).
Review complex variables, Fourier, Laplace, and Z-transforms; convolution, correlation, filtering, deconvolution, probability, sampling and aliasing, spectral estimation. Computer based exercises. Prerequisite: Mathematics 211.
Mr. Gibson

442b. Exploration Geophysics (3-3-4).
Basic principles and procedures involved in geophysical exploration. Emphasis is on reflection seismology, involving acquisition, processing, and interpretation of data. Includes computer exercises. Prerequisite: Geology 361.
Mr. Seriff, Mr. Clark, Mr. Gibson

452b. Advanced Engineering Geology (3-0-3).
Consideration of methods and research in engineering geology. Application of geophysical techniques to specific problems will be emphasized. Students will work as teams on several field projects.
Mr. Clark

453a. Chemistry of the Earth (3-0-3).
An intermediate level, comprehensive geochemistry course with many problem solving exercises. Topics will include both high-pressure, high-temperature as well as low-temperature aqueous geochemistry.
Mr. Heymann

456b. Geochemistry (3-0-3).
Study of terrestrial mechanisms governing the distribution of the chemical elements.
Mr. Adams

459a. Models in Geology (3-0-3).
Discussion of models in general; numerical solutions of heat transfer, folding, and convection problems. Prerequisite: Mathematics 211, 212, Mathematical Sciences 340 or 343, Engineering 240.
Mr. De Bremaecker

461a. Geophysics (3-3-4).
Principles of elastic wave initiation, propagation, and reflection in ideal media and real rocks, with applications to exploration for hydrocarbons. Prerequisite: Mathematics 211, Physics 101, 102. Mathematics 212 recommended, may be taken concurrently.
Mr. Levander, Mr. Seriff

462b. Geophysics: Geodynamics (3-0-3).
The forces which govern the motions and deformations in the earth, and how they are constrained by geophysical and geological measurements. Prerequisite: Mathematics 211, 212; Geology 361.
Mr. De Bremaecker

463a. Advanced Tectonics I (3-3-4).
Mechanics of rock deformation in theory, in experiments, and in nature.
Mr. Avé Lallemant, Mr. Oldow

464b. Fundamentals of Plate Tectonics (2-3-3).
Introduction of plate tectonic theory concerning geometric constraints to plate motions, driving mechanisms, behavior at plate boundaries, and intraplate tectonism. Not offered 1987-88.
Mr. Oldow, Mr. Bally

465a. Comparative Phanerozoic Tectonics (3-3-4).
A synthesis of the Phanerozoic tectonic evolution of the earth. Global investigation of fold-thrust belts, their relationship to convergent plate boundaries, associated structural and stratigraphic relations, and the mechanics of deformation. Prerequisite: Geology 464.
Mr. Bally, Mr. Oldow

481a. Senior Thesis Research in Geology (Variable).
Advanced work adapted to the needs of the individual student.

482b. Senior Thesis Research in Geology (Variable).
See Geology 481.

491a. Special Studies (Variable).
Study in specific fields under the guidance of a staff member.

492b. Special Studies (Variable).
See Geology 491.

501a. Special Studies (Variable).
Advanced work in certain phases of geology adapted to the needs of individual graduate students. Prerequisite: permission of department.

502b. Special Studies (Variable).
See Geology 501.

504a. Clastic Sedimentary Environments, Processes, and Facies(3-0-3).
Study of modern and ancient sedimentary environments with emphasis on field work. Depositional models examined in relation to climatic, oceanographic, and tectonic influences.
Mr. Anderson

505a. Applied Sedimentology (1-6-3).
Field investigation of sedimentary deposits of northwestern New Mexico to provide graduate students in sedimentology with training in field methods, interpretation of sedimentary deposits, and facies mapping. Prerequisite: Geology 504.
Mr. Anderson

506b. Carbonate Sedimentology (3-0-3).
Characterization of modern and ancient, shallow and deep sedimentary environments and facies. Examination of different depositional models in relation to climate, as well as hydrographic and geographic settings. Three field trips. Prerequisite: Geology 332.
Mr. Droxler

511a.-530a. Seminars in Geology (3-0-3).
Individual seminars cover different topics in different years and may be taken more than once.

535a. Stable Isotope Geochemistry (3-0-3).
Review of basic principles of isotope fractionation mechanisms and distribution of isotopes with focus on significance to major geological problems. Not offered 1987-88.
Mr. Baker, Mr. Dunbar

536a. Organic Geochemistry (3-0-3).
Principles and procedures of organic geochemistry applied to important geological problems, petroleum evolution, physical and chemical history of sediments. Not offered 1987-88.
Mr. Baker

537a. Advanced Sedimentary Geology (3-3-4).
Lecture, lab, and field problems focusing on sedimentology and sedimentary petrography. Not offered 1987-88.
Mr. Baker

539a. Advanced Petrology (3-3-4).
Advanced topics in igneous and metamorphic petrology with emphasis on interests of the staff. Modern developments are rigorously examined in physiochemical terms. Offered alternate years.
Mr. Stormer

540b. Advanced Petrology (3-3-4).
Advanced topics in igneous and metamorphic petrology with emphasis on interests of the staff. Modern developments are rigorously examined in physiochemical terms. Offered alternate years.
Mr. Stormer

542b. Advanced Reflection Seismology (3-0-3).
Review of elastodynamics. Calculation of synthetic seismograms for acoustic and elastic media using reflectivity, asympotitic and finite difference methods. Migration of reflection data by finite difference, FK and boundary integral methods. Prerequisite: Geology 441, 442, 461.
Mr. Levander

550b. Advanced Mineralogy and Crystal Chemistry(3-0-3).
Advanced topics in crystal structure, chemistry, thermodynamics, and solution models. Detailed examination of important mineral groups such as feldspars, oxides, carbonates, plylosilicates, etc. Not offered 1987-88.
Mr. Stormer

555a. Advanced Topics in Geochemistry (3-3-4).
Study of selected topics, particularly remote sensing geochronology, radiometry, isotope and trace element analysis.
Mr. Adams

561a. Advanced Topics in Geophysics (3-0-3).
Content varies from year to year: convection, advanced wave propagation, tectonophysics, etc.
Mr. De Bremaecker

562b. Advanced Topics in Geophysics (3-0-3).
Content varies from year to year; convection, tectonophysics, etc.
Mr. De Bremaecker

566b. Experimental Structural Geology (3-3-4).
Selected topics, such as elasticity and plasticity of minerals and rocks. Laboratory work includes experimental rock deformation. Not offered 1987-88.
Mr. Avé Lallemant

568b. Structural Analysis of Deformed Rocks (3-3-4).
Studies of structures, textures, and petrofabrics of deformed rocks, stress and strain analysis.
Mr. Avé Lallemant

572b. Introduction to Inductively Coupled Plasma Sprectroscopy (2-2-2).
An applied workshop on the theory and application of ICP spectroscopy with emphasis on practical experience in quantitative analysis. Prerequisite: approval of instructor. Not offered 1987-88.
Mr. Leeman

574b. Electron Microprobe/Scanning Electron Microscope: Theory (2-2-2).
Fundamental principles, techniques, and applications of the Electron Microprobe/SEM. Emphasis on quantitative analysis and geological problems. Practical laboratory instruction and experience in analytical techniques. Not offered 1987-88.
Mr. Stormer

579a. Preparation of M.A. Thesis Proposal (0-9-3).
Students may not receive credit for both Geology 579 and 580.

580b. Preparation of M.A. Thesis Proposal (0-9-3).
See Geology 579.

589a. Preparation of Ph.D. Thesis Proposal (0-9-3).
Students may not receive credit for both Geology 589 and 590.

590b. Preparation of Ph.D. Thesis Proposal (0-9-3).
See Geology 589.

595c. Summer Research (Credit variable, 1 to 6 hours).
Research conducted during the summer in areas other than thesis work.

800b,a,c Thesis Research (Variable).

Geography Courses

101a. The Earth (3-3-4).
See Geology 101.

Mr. Heymann, Mr. Talwani, Mr. Avé Lallemant, Mr. Droxler

102b. Stratigraphy and Historical Geology (3-3-4).
See Geology 102.

Mr. Vail

German and Slavic Studies

Professor Ewa M. Thompson, *Chair*
Professors S.L. Clark, J.E. Copeland, M. Eifler, K. Weissenberger, J. B. Wilson, and M. Winkler
Associate Professor R.G. Jones
Lecturers David Barry and Albina Hill

German

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Students majoring in German may pursue either of two options: German literature or German studies.
For an option in **German literature** the requirements are:

1. Completion of a program approved by the Department.
2. The equivalent of at least 24 semester hours (eight courses) numbered 300 or higher.

The Department recommends related courses in linguistics, history, philosophy, and other literatures.
For an option in **German studies** the requirements are:

1. Completion of a program which has been defined in close cooperation with the German departmental undergraduate adviser.
2. The equivalent of at least 18 semester hours (six courses) in courses numbered 300 or higher.
3. At least 12 semester hours (four courses) in courses relating to the field of German in other departments. Courses in translation offered by the Department pertaining to German culture and civilization count toward the fulfillment of the area requirement.

This option in German studies, which permits maximum flexibility within a frame of clearly defined objectives, allows an interdisciplinary approach to German affairs. The student can incorporate into the study of German language and literature subject-related courses in political science, history, musicology, art history, philosophy, and economics. The option in German studies is designed for students who are preparing for a career in international law, business, banking, or diplomacy and for graduate study in a variety of fields such as history, political science, library science, art history, etc.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Honors Program. The department offers a special program for outstanding students consisting of independent readings and research which must lead to a substantial honors essay under the supervision of a departmental faculty member. Admission is decided in the second semester of a student's sophomore year.

German Literature in Translation. Courses in German literature in translation ("Germanics") are open to undergraduate students from all disciplines. Readings and discussions are in English. These courses may be repeated for credit.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the Department. Normally, this includes 24 semester hours at the graduate level.
2. Satisfactory performance on a reading examination in one foreign language other than German approved by the Department.
3. Completion of an acceptable thesis.
4. Satisfactory performance on a final oral examination on the thesis and related topics.

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the Department. Normally, this includes 45 semester hours at the graduate level, including those required for the degree of Master of Arts.
2. Satisfactory performance on a reading examination in two foreign languages other than German approved by the Department.
3. Satisfactory performance on a preliminary written and oral examination on the general field of German studies; this examination is based in part on a reading list provided by the Department.
4. Completion of a dissertation approved by the Department; the dissertation is expected to represent an original contribution to knowledge.
5. Satisfactory performance on a final oral examination on the dissertation and related fields.

Note: Requirements 1 and 2 must be met at least a year before the submission of a dissertation.

As part of their training, graduate students, regardless of the type of appointment, will be required to perform some duties, such as assisting in classes, the language laboratory, research, and other activities suggested by the department.

Scholarships: Available for German language studies from the Dr. and Mrs. Earl Douglas Mitchell Fellowship Fund and the Max Freund Prize.

German Courses

101a,b. Elementary German (3-1-4).
Introductory German with emphasis on speaking and reading. The course is supplemented by language laboratory work.
Ms. Clark and Staff

102a,b. Elementary German (3-1-4).
See German 101.
Ms. Clark and Staff

201a,b. Intermediate German (3-0-3).
Grammar, conversation, and extensive reading supplemented by films and language laboratory work.
Ms. Eifler and Staff

202a,b. Intermediate German (3-0-3).
Intermediate language skills with readings and discussion of literary texts and related materials. Prerequisite: German 201, 203 or equivalent.

Ms. Eifler and Staff

209a,b. Independent Work (Credit variable).

305a. Composition and Conversation I (3-0-3).
A variety of reading materials serves as a basis for discussions and compositions. Prerequisite: second-year competence.

Mr. Weissenberger

306b. Composition and Conversation II (3-0-3)
See German 305a.

Mr. Wilson

371a. German Literature 1900-1945 (3-0-3).
Concentrates on the literature of German Expressionism and the Weimar Republic. Not offered every year.

Mr. Weissenberger

372b. German Literature Since 1945 (3-0-3).
Authors who began their careers after 1945; for example, Boll, Grass, Durrenmatt, Weiss. Not offered every year.

Mr. Weissenberger

378b. New German Cinema (3-0-3).
Topic (spring 1988): German women filmmakers. In Germany feminist thought in the arts is strongly represented in cinematic expression. The course will profile well known contemporary women filmmakers such as Export, Genee, Ottinger, Sander, Sanders-Brahms, Stockl, and von Trotta. Screening of their works (subtitled) and analyses (resting on their critical readings) will be done in class.

Ms. Eifler

401a,b. Independent Work in German Literature (3-0-3).
Qualified students work on projects of their choice under the supervision of individual instructors with approval of the undergraduate adviser.

Ms. Eifler

411b. Introduction to Middle High German Language and Literature (3-0-3)
Middle High German language and representative works from literature of the courtly period (twelfth and thirteenth centuries). Open to graduate students for credit. Not offered every year.

500a,b. Graduate Research (Credit variable).
Graduate research and thesis in partial fulfillment for the degree of Masters of Arts.

Staff

511a,b. Graduate Work in German Literature (Credit variable).
With approval of the graduate adviser.

Staff

512a,b. Graduate Independent Work (Credit variable).
With the approval of the graduate adviser.

Staff

522a. Old High German (3-0-3)
Language and literature of the Old High German period (eighth to eleventh centuries); texts from the pagan and monastic traditions. Not offered every year.

Mr. Wilson

531a. Linguistic Structure of German (3-0-3).
Synchronic study of Modern German syntax, phonology, and semantics, including discourse structure. Not offered every year. Also offered as Linguistics 433.
Mr. Copeland

571a. Seminar in the Eighteenth and Nineteenth Centuries (3-0-3).
Specific aspects, problems, and authors of the period.
Mr. Winkler

572a,b. Seminar in the Nineteenth and Twentieth Centuries (3-0-3).
Specific aspects, problems, and authors of the period.
Ms. Eifler, Mr. Weissenberger

592b. Literature of the German Democratic Republic(3-0-3).
Ms. Eifler

600a,b. Graduate Research (Credit variable).
Graduate research and dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy.
Staff

800a,b. Graduate Research (Credit variable).
Staff

Germanics Courses

105a,106b. Introductory Swedish (3-1-4).
Introductory study of Swedish.
Mr. Wilson

406a. Medieval Epic and Romance (3-0-3).
Topic changes from year to year. Readings in English. Not offered every year.
Ms. Clark

391b. New German Cinema (3-0-3).
See German 378b.
Ms. Eifler

Slavic Studies

Degrees offered: B.A.

Undergraduate Program. At least 24 semester hours (eight courses) offered in fulfillment of major requirements must be numbered 300 or higher. Double majors may be allowed to take 18 semester hours (six courses numbered 300 or higher) with the approval of the Department and should consult with the Slavic Studies staff to arrange a program compatible with the other major. Four of the courses may be language courses with the remainder literature or culture; these may be chosen by the student with the adviser's consent. All departmental majors must have their programs approved by the representative of the Department.

No Russian is required for nonmajors who wish to take courses in Russian literature. Lectures and readings are in English. Majors are required to read some of the works and to write assigned papers in Russian.

Scholarships: Available for Russian language studies from the Dr. and Mrs. Earl Douglas Mitchell Fellowship Fund.

Slavic Courses

320b. Slavic Civilization (3-0-3).
Development of Slavic cultures, with emphasis on the modern period.
Ms. Thompson

Russian Courses

101a. Elementary Russian I (3-2-4).
Fundamentals of Russian grammar. Pronunciation, reading, oral practice and translation.
Staff

102b. Elementary Russian II (3-2-4).
See Russian 101.
Staff

201a. Intermediate Russian I (3-0-3).
Grammar review, reading of selected texts, conversation and composition.
Mr. Jones

202b. Intermediate Russian II (3-0-3).
See Russian 201.
Mr. Jones

301a. Conversation and Composition (3-0-3).
Emphasis on composition and conversation with reading of relevant texts.
Ms. Hill

302b. Conversation and Composition (3-0-3).
See Russian 301.
Ms. Hill

312b. Survey of Russian Literature (3-0-3).
Emphasis on the modern period. No knowledge of Russian required.
Ms. Thompson

351a. Dostoevsky (3-0-3).
Study of the major works of Dostoevsky. No knowledge of Russian required.
Ms. Thompson

352a. Tolstoy (3-0-3).
Study of the major works of Tolstoy. No knowledge of Russian required.
Ms. Thompson

401a. Russian Stylistics I (3-0-3).
Designed to improve the spoken and written language with emphasis on syntactic and idiomatic structures.
Ms. Hill

402b. Russian Stylistics II (3-0-3).
See Russian 401.
Ms. Hill

441b. Topics in Russian Literature: Drama Practicum (3-0-3).
Topics change from year to year. May be repeated for credit. Not offered every year.
Staff

450a,b. Independent Study (3-0-3).
Qualified students may conduct research and write a paper on a topic of particular interest.
Staff

Human Performance and Health Sciences

Professor Poindexter, *Chair*
Professors Bearden and Spence
Adjunct Professors Bryan, Butler, Fred, Skaggs, and Weinberg
Associate Professors Bland, Disch, Iammarino, and E.J. Lee
Visiting Associate Professor Evans
Assistant Professors K.A. Davis, Etnyre, A. Shetty
Instructors Lindley, L. Phenix, S.M. Sanders, W. Thomson
Lecturers Bordelon, Eggert, Peters, and Pyung-Soo

Degrees Offered: B.A. with major in physical education; health education as teaching field only.

A minimum of 120 semester hours is required for the Bachelor of Arts with a major in physical education. The University distribution and skills requirements described on pages 54-55 must be satisfied. Students majoring in physical education must complete 38 semester hours of physical education courses and laboratories in accordance with one of the specified Human Performance tracks. Physical Education 105 and 120 and six activity laboratories are required in all tracks. For additional information about the tracks, consult with a departmental faculty adviser.

Both physical education and health education are offered as fields for teacher certification. Students wishing to qualify for teacher certification by the Texas Education Agency must complete 12 semester hours of English, 6 semester hours of American history, 6 semester hours of federal and state government, 18 semester hours of education, 24 semester hours in another teaching field, and 24 semester hours of health education courses or physical education courses, according to which is selected for the teaching field. Requirements are subject to change based on Texas Education Agency regulations.

Health education courses cannot be used to fulfill the requirements for a major in physical education but may be taken as electives by all students.

Physical Education Courses

101a,b. Basic Physical Education (0-2-0).
Skill development, knowledge of rules and strategy, concepts of conditioning, and participation in two physical activities. Required for baccalaureate degree. Normally, it is expected that the requirement be completed during the freshman year.
Mr. Bland

102a,b. Basic Physical Education (0-2-0).
Skill development, knowledge of rules and strategy, concepts of conditioning, and participation in two physical activities. Required for baccalaureate degree. Normally, it is expected that the requirement be completed during the freshman year.
Mr. Bland

105a. Contemporary Sport (3-0-3).
Interactions of philosophy, economics, politics, education, and contemporary social issues in the evolution of sport. For first- and second-year students.
Ms. Poindexter

120b. Scientific Foundations (3-0-3).
An introduction to the scientific areas of human movement: anatomy and physiology, physiology of exercise, motor learning, and kinesiology.
Staff

122a. Basic Aquatics (0-3-1).
Instruction in basic aquatic activities, including mechanics of the various strokes and basic lifesaving.

Mr. Bearden

124b. Conditioning (0-3-1).
Concepts and experience in health-related fitness and conditioning for improved performance. Prerequisite: concurrent or previous enrollment in Physical Education 120 or previous enrollment in 101 and 102.

Staff

125a. Advanced Lifesaving (0-3-1).
Aquatic instruction leading to Advanced Lifesaving Certificate.

Mr. Bearden

126b. Water Safety (0-3-1).
Focus on skiils, theory, teaching progressions, and practice teaching of swimming, lifesaving, and beginning swimming. Completion of requirements leads to certification as Water Safety Instructor. Prerequisite: currently valid Advanced Lifesaving Certificate.

Staff

128a. Racquet Sports (0-3-1).
Skill development, knowledge of rules and strategy, concepts of conditioning, and participation in badminton, racquetball, and squash. Prerequisite: concurrent or previous enrollment in Physical Education 105 or 120 or previous enrollment in 101 and 102.

Mr. Bland

135a. Basic Gymnastics (0-3-1).
An introduction to gymnastics. Activities include tumbling, vaulting, and activities on parallel bars, side horse, rings, high bar, and balance beam. Prerequisite: concurrent or previous enrollment in Physical Education 105 or previous enrollment in 101 and 102.

Mr. Etnyre

204b. Psychological Foundations (3-0-3).
Investigation of the theoretical and empirical psychological foundations of sport and physical activity.

Ms. Poindexter

205a. Sport and Society (3-0-3).
A study of the development of contemporary sport and its interrelationships with existing social institutions.

Ms. Lee

223b. Individual Sports (0-3-1).
Skill development, knowledge of rules, strategy, concepts of conditioning, and participation in archery, golf, and fencing. Prerequisite: concurrent or previous enrollment in Physical Education 105 or previous enrollment in 101 and 102.

Mr. Bearden

228a. Tennis (0-3-1).
Skill development, knowledge of rules and strategy, concepts of conditioning, and participation in tennis. Prerequisite: concurrent or previous enrollment in Physical Education 105 or previous enrollment in 101 and 102.

Ms. Davis

250b. Anatomy and Physiology (3-0-3).
Introduction to human anatomy and physiology, with emphasis on gross structure and basic concepts of function.

Mr. Spence

260b. Sports Management—Public Sector (3-0-3).
Management theory and practice related to public sector sports programs.

Mr. Bearden

300a,b. Sports Management Internship (Credit variable).
Internship experience for senior students in sports management track. Prerequisite: permission of instructor.

Ms. Davis

302b. Kinesiology (3-0-3).
Anatomical and mechanical bases of human movement with emphasis on the analysis of sport and exercise skills. Prerequisite: Physical Education 120, 250, or permission of instructor.

Mr. Shetty

304b. First Aid, Emergency Care, CPR (2-1-2).
The American Red Cross certification program for emergency care procedures for illness, traumatic injuries, and cardiopulmonary resuscitation. Limited enrollment: 25. Also offered as Health and Physical Education 308.

Staff

305a. Exceptional Children (3-0-3).
Areas of exceptionality displayed by children within the school or institution relative to the physical educator's role.

Mr. Bearden

308b. Program Development in Physical Education (3-0-3)
Teaching methodology, program development, and implementation of teaching techniques and class management. For Junior and Senior students.

Ms. Lee

311a. Motor Learning (3-0-3).
Physiological, neurological, and psychological factors affecting voluntary skill acquisition and development.

Ms. Poindexter; Mr. Etnyre

314a,b. Methods Practicum (0-3-1).
Practicum in the application of teaching methods in physical education activities. Prerequisite: concurrent or previous enrollment in Health and Physical Education 308.

Ms. Lee

319a. Tests and Measurements (3-0-3).
Introduction to basic statistics, test construction and evaluation, and elementary measurement theory in physical education.

Mr. Disch

321a. Physiology of Exercise (3-0-3).
Physiologic response of the circulatory, respiratory, and muscular systems to exercise stress. Prerequisite: Physical Education 120 or permission of instructor.

Mr. Spence

323a. Physiology of Exercise (0-3-1).
Measuring physiologic response to exercise stress. Prerequisite: concurrent enrollment in Health and Physical Education 321.

Mr. Spence

324b. Officiating (0-3-1).
Rules and mechanics of officiating basketball and volleyball.

Mr. Disch

326a. Training Room Procedures (0-3-1).
Field application in prevention, management, and rehabilitation of athletic injuries. Limited enrollment: 24.

Mr. Eggert

334b. Team Sports (0-3-1)
Selected team sports including volleyball and soccer. Prerequisite: PHED 124 and two of: PHED 122, 126, 128, 135, 223, 228, 337.

Mr. Disch

337a. Basic Movement—Dance (0-3-1).
An introduction to modern dance techniques and improvisation.

Ms. Phenix

338b. Dance Technique and Improvisation (0-3-1).
An advanced class in modern dance techniques and improvisation.

Ms. Phenix

341a. Sports Medicine and Training (3-0-3).
The following areas are integrated: anatomy and physiology of sports, emphasizing orthopedic anatomy and circulorespiratory physiology; clinical medicine; prevention and management of athletic injuries.

Mr. Spence

350a,b. Coaching Internship (Credit variable).
Intership experience for senior students in coaching program. Prerequisite: permission of instructor.

Mr. Disch

361a. Sport Management—Private Sector (3-0-3).
Management theory and practice related to private sector sports programs. Prerequisite: Physical Education 260 or permission of instructor.

Ms. Davis

362b. Sports Information (3-0-3)
The role of communication media in sports. For junior and senior students only.

Ms. Davis.

375a,b. Sports Science Internship (Credit variable).
Intership experience for senior students in sports medicine and sports science tracks. Prerequisite: permission of instructor.

Mr. Spence

411a. Concepts and Techniques of Athletic Coaching (2-0-2).
Coaching techniques, concepts, and problems in major athletic sports. Prerequisite: permission of instructor.

Mr. Etnyre

412b. Motor Control (3-0-3).
Exploration of the neurophysiological, behavorial, and biomechanical aspects of motor control.

Mr. Etnyre

Athletic Coaching of Team Sports (2-0-2)
Study of coaching methods and strategies for developing high level athletic performance.

431b. Coaching of Basketball (2-0-2).

Mr. Disch

432b. Coaching of Baseball (2-0-2).

Mr. Bland

433a. Coaching of Football (2-0-2).

Mr. Bland

434b. Coaching—Track and Field (2-0-2).

Mr. Spence

435b. Coaching—Soccer (2-0-2).

Staff

436a. Coaching of Volleyball (2-0-2).

Mr. Disch

464b. Sport and the Law (3-0-3).
Legal aspects of sport and recreation. For junior and senior students only.

Ms. Davis

490b. Seminar in Sports Medicine (3-0-3).
Case study approach is used to present sports related injuries, management and rehabilitation. Prerequisite: PHED 341.

Mr. Spence; Staff

495a. Independent Study (Credit variable).
For junior and senior students only.

Ms. Lee

496b. Independent Study (Credit variable).
See Physical Education 495.

Ms. Lee

498a,b. Special Topics (Credit variable).

Ms. Poindexter

Health Courses

103b. Nutrition (3-0-3).
Concepts underlying the science of nutrition: food composition; calories, and need for energy, special nutrients, and nutritional deficiencies.

Staff

107a. Concepts in Health Science (3-0-3).
Designed to acquaint prospective health educators with the structure and function of health in our society.

Staff

201a. Introduction to Environmental Systems (4-0-4).
The chemical, physical, and biological components of the environment as natural resources and the effect of pollution on their maintenance and utilization. Also offered as Environmental Science and Engineering 201.

Mr. Ward

208b. Chemical Alterations of Behavior (3-0-3).
Investigates the use, abuse, and misuse of alcohol, tobacco, and psychoactive drugs.

Staff

306b. Human Sexuality (3-0-3).
Designed to explore the physiological, psychological, and sociological parameters of human sexuality, to provide accurate sex information, and to develop healthy attitudes toward sexuality.

Mr. Iammarino

308b. First Aid/Emergency Care/CPR (2-1-2).
American Red Cross certification program for emergency care procedures for illness, traumatic injuries, and cardiopulmonary resuscitation. Enrollment limited to 25. Also offered as Physical Education 304.

Staff

407a. Diseases of the Human Organism (3-0-3).
Study of communicable, noncommunicable, and behavioral diseases with emphasis on the disease process and basic epidemiologic methods.

Mr. Iammarino

410b. Program Development in Health Education (3-0-3)
Content and methods in teaching health education; program materials and curriculum construction in secondary school health education programs. Required for teaching certification in Health.

Staff

495a. Independent Studies (Credit variable).

Mr. Iammarino

496b. Independent Studies (Credit variable).

Mr. Iammarino

498a,b. Topics in Health Education (Credit variable).

Mr. Iammarino

History

Professor Van Helden, *Chair*
Professors Boles, Drew, Gruber, Haskell, Hyman, Loewenheim, Matusow, R.J. Smith, Stokes, and Wiener
Associate Professors Seed and Wolin
Assistant Professors Maas and Sanders
Mellon Visiting Assistant Professor Shaw
Lecturer Zdatny
Adjunct Assistant Professor Lipartito

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. A student majoring in history must take a minimum of 30 semester hours (ten courses) in history, of which 18 semester hours (six courses) must be on the advanced level (300 or 400). At least six semester hours (two courses) must be taken in the history of the United States and at least 12 semester hours (four courses) in non-U.S. history. Of these four non-U.S. history courses, at least one (three semester hours) must be non-European as well. Students majoring in history will also be required to take at least six semester hours (two courses) from a designated list of seminars/colloquia devoted mainly to writing and discussion. Students are advised to acquaint themselves with humanistic disciplines other than history (for example, literature, fine arts, and philosophy) and also with social sciences such as political science, sociology, economics, and anthropology, whose contributions to historical studies are of increasing importance. Some foreign language proficiency is recommended for the potential traveler, researcher, or graduate student (most graduate schools require a reading knowledge of French and German for the Ph.D. degree).

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

GraduateProgram. Graduate students in history are accepted for study leading to either the M.A. or Ph.D. Holders of the B.A. degree (or its equivalent) from an acceptable institution are eligible to apply. The graduate program is designed to train a limited

number of carefully selected students. Both the M.A. and the Ph.D. degrees are offered in limited areas of American and European history. Further information about the fields may be obtained on request from the department.

Graduate fellowships as well as graduate scholarships within the limits of available funds are awarded to qualified students with demonstrated ability. Fellowships include a stipend and a waiver of tuition; scholarships provide a waiver of tuition only. As a part of their training, all graduate students are expected to render limited services to the department as tutorial instructors, as research assistants, or as assistants to the editors of the *Journal of Southern History* or *The Papers of Jefferson Davis,* both of which are sponsored by Rice University.

Requirements for the Degree of Master of Arts. Candidates for the M.A. degree are expected to complete a certain amount of formal class or seminar work, usually 24 semester hours; pass a reading examination in one foreign language (usually French or German); take one graduate colloquium and one graduate seminar; and write a thesis under the direction of an advisory committee of the department headed by a professor having special competence in the subject area of the thesis. An oral defense of the thesis is also required. Completion of these requirements usually takes two years. Not more than three years may elapse between the time the student is admitted to graduate study and the completion of the degree, unless an extension is approved by the departmental graduate committee. An alternate M.A. degree is available to doctoral students who fulfill the special requirements set by the department.

Requirements for the Degree of Doctor of Philosophy. Candidates for the Ph.D. degree are expected to prepare themselves for a qualifying examination in three fields, at least two of which must be in the major area of concentration (European, American, or other history). The two fields in the major area of concentration should include one broadly defined field and one more narrow concentration within that broad area (e.g., U.S. history and slavery; modern European history and the Hitler era; Latin American history and capitalism in the modern world). If the major area is European history, the third field must be in American history; if the major area is in American history, the third field must be in European history. If the major area is outside American or European history, the third field must be in either American or European history. Preparation for this qualifying examination (the passing of which qualifies the student to apply for formal admission to candidacy for the Ph.D. degree) normally includes course work, directed reading, and a substantial amount of independent reading. This work must also include at least two graduate colloquia and two graduate seminars. The department has no specific requirements for the number of hours that must be completed, but Ph.D. students are expected to remain full-time students from their entry into the program until they pass their qualifying examination. The qualifying examination usually is oral, though it may be written or both written and oral at the discretion of the department. It is given only after the student has completed all necessary course and seminar work and passed reading examinations in two foreign languages (usually French and German). Students should take the qualifying examination before the beginning of their sixth semester and must take it before the beginning of the seventh semester. In addition to the foreign language examinations and the qualifying examination, the Ph.D. candidate must present a dissertation embodying the results of original research and defend it in a public oral examination. This dissertation must be completed within three calendar years after passing the qualifying examination, unless an extension is granted by the departmental graduate committee.

History

History Courses

101a. European History to 1848 (3-0-3).
Why has the world been so thoroughly reshaped by the European experience? A comprehensive attempt to answer that question. Recommended for freshmen and sophomores. Offered with additional work as History 301.

Mr. Stokes

102b. European History, 1848-1985 (3-0-3).
Continuation of History 101. Recommended for freshmen and sophomores. Offered with additional work as History 302.

Mr. Stokes

152b. Freshman Seminar in Ancient History (3-0-3).
The Hero and his Companion from Gilgamesh to Sam Spade. How does presentation of heroic action illustrate the basic values of a society? Through consideration as historical sources of several ancient texts, modern mystery stories, and two "western" movies, we will see the development of a style of community service that links heroism with alienation. The extent to which women participate will be traced. Interested students must see Professor Maas by the end of the fall semester. Enrollment is limited.

Mr. Maas

201a. Introduction to Ancient History (3-0-3).
Why are the ancient civilizations of the Near East, Greece, and Rome important and how do we go about studying them? This course surveys major contributions of the ancient world to western civilization and examines the premises of modern interpretations.

Mr. Maas

202b. Medieval History (3-0-3).
A history of the late Roman Empire and the Middle Ages.

Ms. Drew

211a. American Thought and Society I (3-0-3).
A topical introductory survey of seventeenth- and eighteenth-century American history, primarily concerned with intellectual and social developments underlying the surface of events. Offered with additional work as History 311.

Mr. Haskell

212b. American Thought and Society II (3-0-3).
A topical introductory survey of nineteenth- and twentieth-century American history, primarily concerned with intellectual and social developments underlying the surface of events. Offered with additional work as History 312.

Mr. Haskell

213b. Slavery in North America (3-0-3).
An interdisciplinary examination of all aspects of United States slavery, from the African background through emancipation. Offered with additional work as History 413.

Mr. Boles

223a. History of Science (3-0-3).
A broad survey of the development of scientific ideas and methods from the ancient Greeks to the end of the seventeenth century. No expertise in science required.

Mr. Van Helden

224b. History of Modern Science (3-0-3).
A broad survey of the development of scientific ideas and methods since about 1700. No expertise in science required.

Mr. Van Helden

261a. History of England: Reformation to 1815 (3-0-3).
The personalities and forces that changed England from a backwater of Europe into the leading nation in the world. Lectures, discussions, and frequent short papers. Offered with additional work as History 361.

Mr. Wiener

262b. History of England: 1815 to the Present (3-0-3).
England's "take-off" into the Industrial Revolution and how it has adapted to it. The twentieth century decline. Novels, biographies, and other materials are used to examine the transformation of British society in the past two centuries. Lectures, discussions, and frequent short papers. Offered with additional work as History 362.

Mr. Wiener

265b. Contemporary History (3-0-3).
Our own years in historical perspective. The world since Nixon and Kissinger. Reading includes latest memoirs and biographies, leading newspapers and periodicals, also television and radio news.

Mr. Loewenheim

269b. U.S.-Latin American Relations (3-0-3).
This course is a basic history of U.S.-Latin American Relations from 1775 to the present. Particular attention is given to twentieth century policies and problems focusing on intervention since 1945. Offered with additional work as History 469.

Ms. Seed

271a. History of France to 1815 (3-0-3).
The first part of a two-semester survey of French history focusing on the structures of French society and the crash of the Old Regime. Offered with additional work as History 371.

Mr. Zdatny

272b. History Of France Since 1815 (3-0-3).
Revolutions, industrialization, civil wars, culture, cuisine, the fall from Great Power status—and why the French are still sensitive about it. Offered with additional work as History 372.

Mr. Zdatny

297a. Constutional and Legal History of the U.S. I(3-0-3).
Major questions in the historical development of American law and governing institutions. Offered with additional work as History 397.

Mr. Hyman

298b. Constitutional and Legal History of the U.S. II(3-0-3).
Major questions in the historical development of American law and governing institutions. Offered with additional work as History 398.

Mr. Hyman

301a. European History to 1848 (3-0-3).
An enriched version of History 101. Students may not receive credit for both History 101 and 301. Recommended for juniors and seniors.

Mr. Stokes

302b. European History, 1848-1985 (3-0-3).
An enriched version of History 102. Students may not receive credit for both History 102 and 302. Recommended for juniors and seniors.

Mr. Stokes

303a. Undergraduate Independent Reading (3-0-3).
Independent reading under the supervision of a faculty member. Open to a limited number of advanced students with special permission.

304b. Undergraduate Independent Reading (3-0-3).
Independent reading under the supervision of a faculty member. Open to a limited number of advanced students with special permission.

306b. Politics and Society in Ancient Greece (3-0-3).
Discussion of the main developments in social, political, and intellectual life in the Greek world from the end of the Mycenaean Age to the advent of Alexander the Great.

Mr. Maas

309a. Decine and Fall of the Roman Empire (3-0-3).
What was the "fall" of the Roman Empire? This course examines the circumstances of the end of Roman political authority in western Europe. Ancient and modern theories will be considered, with special emphasis on the importance of the Germanic invasions.

Mr. Maas

311a. American Thought and Society I (3-0-3).
An enriched version of History 211. Students may not receive credit for both 211 and 311.

Mr. Haskell

312b. American Thought and Society II (3-0-3).
An enriched version of History 212. Students may not receive credit for both History 212 and 312.

Mr. Haskell

313a. Business and Modern American Society (3-0-3).
Has American business seen better days? If so, what were they like? This course will explore the rise of the modern business system and its relationship to American society between 1880 and the present. Some of the topics include: the role of the entrepreneur, regulation, labor unions and organizations, women in the labor force, and the emergence of multinational enterprise.

Mr. Lipartito

327a. Colonial Latin American History I (3-0-3).
The first part of a two-semester survey course of colonial Latin America focusing on construction of the self and "other" narrative strategies and rhetoric. The colonial part examines narratives of conquest, travel, and piracy in Latin America and the Caribbean in the sixteenth and seventeenth centuries.

Ms. Seed

328b. Modern Latin American History II (3-0-3).
This is the second part of a two semester course on Latin America focusing on construction of the self and "other" narrative strategies, and rhetoric in contemporary Latin America. The modern half examines nineteenth- and twentieth-century essays and novels dealing with modern Latin American identity. Readings include Sarmiento, Paz, and Naipaul.

Ms. Seed

339b. Morality and History (3-0-3).
Does it subvert the very idea of morality to say that it has a history, that it is susceptible to change? Students in this discussion and writing course will grapple with this problem through selected readings drawn mainly from Anglo-American history and philosophy that range over a period of several centuries.

Mr. Haskell

340a. Victorian Intellectuals (3-0-3).
The upheaval in late nineteenth century social thought and culture associated with Darwin's theory of evolution. Readings (mainly American, but including English and continental writers for comparison) may include Spencer, Veblen, Henry Adams, William James, Dewey, Matthew Arnold, and Nietzsche.

Mr. Haskell

349a. Age of Bismarck (3-0-3).
The history of Europe from the French Revolution and Napoleon to Bismarck, Gladstone, and the Spanish American War.

Mr. Loewenheim

350a. America in the Twentieth Century (3-0-3).
Survey of major economic, social, and political developments in the United States from 1900 to 1940. Lectures, readings, discussions and one research paper. By permission of the instructor; limited to 40 students.

Mr. Matusow

359a. Roman Britain and Medieval England (3-0-3).
Survey of historical developments in Roman Britain and Medieval England with special attention to social, economic, and religious factors.

Ms. Drew

361a. History of England: From the Reformation to 1815 (3-0-3).
An enriched version of History 261. Students may not receive credit for both History 261 and 361.

Mr. Wiener

362b. History of England From 1815 (3-0-3).
An enriched version of History 262. Students may not receive credit for both History 262 and 362.

Mr. Wiener

371a. History of France to 1815 (3-0-3).
An enriched version of History 271. Students may not receive credit for both History 271 and 371.

Mr. Zdatny

372b. History of France Since 1815 (3-0-3).
An enriched version of History 272. Students may not receive credit for both History 272 and History 372.

Mr. Zdatny

391a. Capitalism and Culture (3-0-3).
What are the cultural consequences (ethical, aesthetic, and religious) of capitalism as a social formation? This question will be addressed through an examination of the work of several major social theorists, classical and contemporary. Among the authors treated will be Marx, Weber, Parsons, Habermas, and Bell.

Mr. Wolin

397a. Constitutional and Legal History of U.S. I (3-0-3).
An enriched version of History 297. Students may not receive credit for both History 297 and 397.

Mr. Hyman

398b. Constitutional and Legal History of the U.S. II (3-0-3).
An enriched version of History 298. Students may not receive credit for both History 298 and 398.

Mr. Hyman

403a. Senior Thesis (3-0-3).
Open to well-qualified students with special permission. Students must take both History 403 and 404 to gain credit.

404b. Senior Thesis (3-0-3).
See History 403.

405a. Fascism (3-0-3).
A look at the most murderous political philosophy of our time, at the leaders (Mussolini, Hitler), the followers, and the victims.

Mr. Zdatny

406b. The French Revolution (3-0-3).
An in-depth examination of "the first modern revolution": regicide, terror, counterrevolution—"the rule of the people," the marriage of ideals, and the guillotine.

Mr. Zdatny

413b. Slavery in North America (3-0-3).
An enriched version of History 213. Students may not receive credit for both History 213 and 413.

Mr. Boles

423a. Women in Early Modern Europe (3-0-3).
This course develops a critical feminist perspective on the historical issues of the early modern era. Topics covered include: the coming of capitalism, the Reformation, the expansion of literacy, the demographic transition, and the development of seventeenth-century science.

Ms. Seed

430b. Values and Social Policy, Past and Present (3-0-3).
Changing understandings of the problems of "crime" and "poverty," and what to do about them, nineteenth century to the present, in Britain and the United States. An attempt to bring historical perspective to bear upon current issues, and to place social policy in cultural and ideological context. Lectures, discussions and a research paper.

Mr. Wiener

431a. Victorian Morality (3-0-3).
The rise and decline of a set of attitudes and values about human nature and behavior that flourished widely in the nineteenth century. Social sources and functions of this morality will be stressed, in particular its role in structuring class, gender, and generational relations in an age of rapid change. Britain will be the geographical focus, with glances at the United States and Western Europe. Material examined will include literature and art. Lectures, discussions, and a research paper.

Mr. Wiener

440a. Social and Economic History of Europe in the Middle Ages (3-0-3).
Seminar covering selected problems in the social and economic history of medieval Europe.

Ms. Drew

454b. Reporting From the Unfree World (3-0-3).
How Western journalists have viewed authoritarian and totalitarian regimes in the twentieth century, from the Russian Revolutions of 1917 to the present, the background and impact of their accounts on public opinion and offical policy.

Mr. Loewenheim

456a. Decline of the Western World 1914-39 (3-0-3).
Europe from 1914 to 1939: the First World War and its consequences, with special attention to the historic role of the United States in world affairs.

Mr. Loewenheim

466b. American Revolution, 1754-1789 (3-0-3).
The origins and implications of the American Revolution, emphasizing constitutional, social, and political developments.

Mr. Gruber

469b. U.S.-Latin American Relations (3-0-3).
An enriched version of History 269. Students may not receive credit for both History 269 and History 469.

Ms. Seed

492b. Michel Foucault (3-0-3).
The late French theorist Foucault is commonly regarded as one of the greatest thinkers of the post-war era. After an introductory account of some of the major influences on his thought (Heidegger, Nietzsche, French Structuralism), the course will proceed to a detailed scrutiny of his major works and their social context.

Mr. Wolin

494b. Problems in Nineteenth- and Twentieth-Century European History (3-0-3).
A discussion and pro-seminar on various problems of nineteenth and twentieth century European history. Different topics are covered in different years. For spring 1988 the topic will be "Change in Eastern Europe: is it possible?"

Mr. Stokes

501a. Master's Historical Research (Variable).
Master's thesis. Students must take both History 501 and 502 in order to gain credit.

502b. Master's Historical Research (Variable).
See History 501.

503a. Graduate Topics (Variable).

504b. Graduate Topics (Variable).

511a. Directed Readings in American History I (4-0-4).
For graduate students only.

512b. Directed Readings in American History I (4-0-4).
For graduate students only.

513a. Directed Readings American History II (4-0-4).
For graduate students only.

514b. Directed Readings in American History II (4-0-4).
For graduate students only.

517a. Directed Readings in Science and Technology (4-0-4).
For graduate students only.

Mr. Van Helden

518b. Directed Readings in Science and Technology (4-0-4).
For graduate students only.

Mr. Van Helden

521a. Directed Readings in Medieval History (4-0-4).
For graduate students only.

Ms. Drew

522b. Directed Readings in Medieval History (4-0-4).
For graduate students only.

Ms. Drew

527a. Directed Readings in Non-Western History (4-0-4).
For graduate students only.

528b. Directed Readings in Non-Western History (4-0-4).
For graduate students only.

529a. Directed Readings in Modern European History I (4-0-4).
For graduate students only.

530b. Directed Readings in Modern European History I (4-0-4).
For graduate students only.

531a. Directed in Readings Modern European History II (4-0-4).
For graduate students only.

532b. Directed Readings in Modern European History II (4-0-4).
For graduate students only.

533a. Graduate Colloquium in European History (4-0-4).
For graduate students only.

Mr. Stokes

581b. Graduate Seminar in Medieval History (4-0-4).
Offered when demand justifies.

Ms. Drew

583a. Seminar in Southern History (4-0-4).
The topic in 1987 will be religion and slavery in the Old South.

Mr. Boles

585a. U.S. Constitutional and Legal History (4-0-4).
Significant constitutional and legal questions stressing civil liberties, criminal law, civil-military relations, race relations, and urban problems.

Mr. Hyman

586b. U.S. Constitutional and Legal History (4-0-4).
Significant constitutional and legal questions stressing civil liberties, criminal law, civil-military relations, race relations, and urban problems.

Mr. Hyman

591a,b. Graduate Reading (1-0-1).
Graduate reading in conjunction with another course.

Mr. Van Helden

592b,a. Graduate Reading (1-0-1).
See History 591.

Mr. Van Helden

593a,b. Graduate Reading (1-0-1).
See History 591.

Mr. Van Helden

800a,b. Ph.D. Research (Variable).
Doctoral dissertation.

Mr. Van Helden

Humanities

Program in Humanities. This program is designed for undergraduates seeking a wide-ranging, critical, and integrated introduction to the humanities. In small group discussions, occasional lectures, and their own essays, students will encounter enduring issues in Western civilization. For students planning a humanities major, Humanities 260-261 will provide an excellent foundation for advanced study; for other students these courses offer valuable contributions to general education.

260a. Great Books of the West (3-0-3).
Discussions and periodic lectures on Homer, Sophocles, Thucydides, Plato, Aristotle, Cicero, Virgil, Tacitus, Exodus, Romans, and St. Augustine.

Mr. Huston, Mr. Wolin, Mr. Yunis

261b. Great Books of the West (3-0-3).
Discussions and periodic lectures on Locke, Hume, Rousseau, Kant, Dostoyevsky, Marx, and Freud.

Mr. Crowell, Mr. Wolin

360a. Great Books of the West (3-0-3).
Enriched version of Humanities 260.

Mr. Huston, Mr. Wolin, Mr. Yunis

361b. Great Books of the West (3-0-3).
Enriched version of Humanities 261.

Mr. Crowell, Mr. Wolin

Joint Venture (Business and the Humanities). The Rice Joint Venture Program is designed to provide students with majors in the humanities the opportunity to explore their interests in a possible business career. Students accepted for the program in the fall will register for Humanities 301, which will be offered in the spring. The course is an introduction to business with emphasis on basic business concepts. As a part of the curriculum, each student will also work part-time for a Houston-area business firm during the semester. Students will gain an understanding of the business community while gaining valuable experience and contacts in the business world.

301b. Introduction to Business (3-0-3).
Limited to junior and senior humanities majors.

Ms. Phillips

Other Humanities Listings

201b. Public Speaking (3-0-3).
Permission of instructor.

Mr. Huston

270a. Introduction to Women's Studies (3-0-3).
Major texts of modern feminist thought (Mary Daly, Dorothy Dinnerstein, Mary Ellmann, Gerda Lerner, Juliet Mitchell, Adrienne Rich, Virginia Woolf).

Ms. Gallop

315a. Writing Practicum (1-0-1).

Ms. Driskill

316b. Writing Practicum (1-0-1).

Ms. Driskill

320b. Introduction to Medieval Culture (3-0-3).
Insights into literature, art, philosophy, history, science, and cuisine of the middle ages. Also listed as English 320. Not offered every year. Not offered 1987-88.

Ms. Chance

375b. Freud (3-0-3).
Covers the major writings by the founder of psychoanalysis and explores their importance for twentieth century thought.

Ms. Gallop

Linguistics and Semiotics

Professor Lamb, *Chair*
Professors Copeland, P.W. Davis, and Tyler
Associate Professor Urrutibeheity
Adjunct Professor E.D. Mitchell
Instructor Chen

Degree Offered: B.A., M.A., Ph.D.

Undergraduate Program. As language plays an important role throughout human life, linguistics is by its nature an interdisciplinary field. The undergraduate major therefore includes at least two non-linguistics courses, chosen in accordance with an area of concentration. The major may be undertaken with any of three areas of concentration: Cognitive Science, Language, Textual Semiotics. All majors are required to take at least eight courses (24 semester hours) in linguistics, including at least the three core courses: 300 (Linguistic Analysis), 301 (Phonology), and (402) Syntax and Semantics. The remaining requirements depend on the student's area of concentration, as follows:

Cognitive Science Concentration. Besides the three core courses, the eight required courses in linguistics must include at least two of the following: 306 (Cognitive Linguistics), 315 (Information Structures), 317 (Computation for Linguists), 411 (Neurolinguistics). In addition, the major must include at least two courses (six semester hours) in cognitive studies in other departments, chosen in consultation with the undergraduate major adviser. Appropriate courses in other departments include Anthroplogy 406 (Cognitive Anthropology) and relevant courses in psychology and computer science.

Language Concentration. In addition to the eight required courses in linguistics, at least two semesters in a foreign language at the level of 300 or higher and two semesters in another language at the level of 200 or higher. Chinese and Sanskrit are especially recommended.

Textual Semiotics Concentration. At least two semesters in a foreign language at the level of 300 or higher and at least two courses in textual semiotics. The latter, which may be counted among the eight required courses in linguistics,may be any two of the following: English 396 (Language and Philosophy in Literature), 414 (Hermeneutics and Linguistic Anthropology), 420 (Literary Semiotics), and French 491 (Text, Textuality, Literary Modernity).

In addition to the departmental requirements for the major, students must satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68

Honors Program. The primary purpose of the Honors Program is to provide selected undergraduate majors with an opportunity to receive advanced training, particularly in the planning and execution of independent research within their chosen areas of specialization in linguistics. A secondary purpose of the program is to establish an administrative framework for the formal recognition of outstanding students. Majors considering a career in linguistics are strongly encouraged to apply, as are all others who desire the experience of an intensive, individual research project as part of their undergraduate education.

Application to the Honors Program should be made in person to the undergraduate adviser no later than the tenth week of the second semester of a student's junior year. In support of the application, the student must prepare a brief description of the proposed research project signed by the faculty member who is to supervise the work. Acceptance

into the program is at the discretion of the linguistics faculty. A statement of eligibility requirements and program requirements is available in the departmental office.

Graduate Program. The graduate program admits students planning to study for the Ph.D. degree on a full-time basis. It is structured to ensure for each student a thorough grounding in general linguistics and a sound introduction to advanced research in some field of special interest. Linguistics at Rice is treated as an inherently interdisciplinary field, with connections not only to language and literature studies, but also to psychology, anthropology, computer science, and philosophy. Study of computer science enhances a student's career opportunities as well as his or her research skills. Semiotics, as practiced at Rice, is the still broader field resulting from the extension of the concepts and analytical tools of linguistics to the broader class of languagelike systems in general, including literary and artistic works and other products of human culture as well as information systems occurring in nature.

Undergraduate preparation need not include linguistics courses as such but should include courses in at least two of the following areas: anthropology, cognitive science, computer science, electrical engineering, foreign languages, logic, discrete mathematics, philosophy, and psychology. Fellowships are available for especially well-qualified students.

During the first year of residence, each entering graduate student will work closely with the linguistics graduate adviser to choose a plan of study congruent with the demands of the program and with his or her individual interests. Subsequent training is by course work, seminars, independent field study, and guided research. Students are encouraged to select areas of specialization that fit the research interests and activities of the faculty.

All students are expected to acquire a command of general linguistics and to select one or two areas of concentration. Recommended areas of concentration are:

Anthropological Linguistics
Cognitive Science
Computational Linguistics
English Linguistics
Germanic Linguistics
Semiotics
Romance Languages

At the end of the second semester of residence, each student is required to undergo an oral qualifying examination. The purpose of this examination is to assess the student's progress and potential as well as to identify areas of strengths and weaknesses. Continuation to the second year requires satisfactory performance on this examination. Students who pass with distinction are urged to go on directly to the Ph.D. degree. Others are eligible for a master's degree upon completion of an appropriate thesis.

Following successful completion of the qualifying examination, each student, on the basis of discussions with faculty members, and in accordance with his or her proposed area of concentration, selects a committee of advisers from among the faculty, typically a major adviser and two or three minor advisers. The major adviser will act as chairman of the committee during the student's tenure in the program, the committee members serve as mentors and assist the student in designing an individually tailored program of advanced studies and research. The composition of the committee can be changed at any time upon agreement between the student and the advisers. Emphasis is placed on a close working relationship between the student and the members of this special committee.

On completion of the required course work and by agreement of the special committee, the student presents himself or herself to the faculty for a public comprehensive examination. This examination consists of written and oral parts and covers general linguistics and the area(s) of concentration. Responsibility for administering the examination and the determination of the results rest with the student's special committee. The linguistics graduate adviser is an *ex-officio* member of each examining committee.

For the Ph.D. degree, competence in two foreign research languages is required. In addition, a structural knowledge of a non-Indo-European language is expected. The appropriateness of the languages is determined in consultation with the graduate adviser,

and in some cases specific research languages may be required because of the student's research area.

In addition to formal instruction, graduate students are given the opportunity to gain teaching experience by participating with the faculty in the design of courses and instruction of undergraduate students.

Each student is expected to present a dissertation research proposal to his or her special committee, normally by the time of the comprehensive examination. Such a proposal is required for admission to candidacy, and it must be approved by the student's special committee. At this time a dissertation adviser is selected. Normally, this is the chairman of the special committee, but with the agreement of the student and the committee members, a different dissertation adviser may be selected from within or from outside the special committee. Each student presents himself or herself for a public examination in defense of the completed dissertation. Responsibility for accepting the dissertation rests with the special committee.

Linguistics

Linguistics Courses

200a. Language (3-0-3).
An introduction of the scientific study of language, the methods of linguistic prehistory, the language families of the world, and the interrelationships of language and thought. Also offered as Anthropology 200.

Mr. Copeland

300b. Linguistic Analysis (3-0-3).
English and other languages as objects of scientific analysis; phonological structure, morphology and syntax, semantic structure, techniques of linquistic analysis. Also offered as Anthropology 300.

Mr. Copeland

301a. Phonology (3-0-3).
Articulatory phonetics, the analysis of speech; structural patterns which underline speech sounds. Types of phonological structure found in the world's languages. Also offered as Anthropology 301.

305b. Historical Linguistics (3-0-3).
The processes of linguistic change and their relationships to social and geographical contexts. Emphasis on Indo-European. Also offered as Anthropology 305.

Mr. Copeland

306b. Cognitive Linguistics (3-0-3).
The study of linguistic data as evidence for the structure of the information system which makes it possible for a speaker of a language to speak and understand the language.

Mr. Lamb

309a. Psychology of Language (3-0-3).
Human and other animal communication, structure of human language, word meaning and semantic memory, psychological studies of syntax, bilingualism, language and thought, language errors and disorders. Also offered as Psychology 309.

10b. **Language Development** (3-0-3).

313a. Language and Culture (3-0-3).
Investigation of the systematic relations between linguistic form and expression and culture. Also offered as Anthropology 313.

Mr. Tyler

315a. Information Structures (3-0-3).
Properties of selected semiotic systems. Relational networks, laws of form, digital logic networks. Computer data structures, human cognitive structures. Formerly Linguistics 415.
Mr. Lamb

317b. Computation for Linguists (3-0-3).
Techniques in the computer processing of natural language data.
Mr. Lamb

353b. Philosophy of Language (3-0-3).
Philosophical investigation of relations among language, thought, and reality. Specific topics include such notions as analyticity, meaning, reference, and speech act. Prerequisite: two courses in linguistics or philosophy. Also offered as Philosophy 353.

394a. Structure of English Language (3-0-3).
Introduction to modern English grammar, phonology, and semantics. Also offered as English 394.
Mr. Davis

395b. History of the English Language (3-0-3).
Also offered as English 395.
Mr. Mitchell

403a. Modern Linguistic Theory (3-0-3).
Selected theories of language from de Saussure to the present.

407a. Field Techniques and Analysis (3-0-3).
Techniques and practice in the observation, analysis, and recording of a human language. Also offered as Anthropology 407.
Mr. Davis

408b. Field Techniques and Analysis (3-0-3).
Continuation of Lingistics 407.
Mr. Davis

409b. Special Topics (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year. Prerequisite: Linguistics 300 or permission of instructor.

414a. Hermeneutics and Linguistic Anthropology (3-0-3.
Application of linguistic theory and method in the analysis of cultural materials. Discourse analysis; the structure and interpretation of texts and conversation.
Mr. Tyler

420b. Literary Semiotics (3-0-3).
Studies in application of semiotic models to the study of literature.
Mr. Kauffman

423a/b. The Spanish Language (3-0-3).
Synchronic study of modern Spanish phonology and syntax, including peninsular and Hispanic-American variants. Also offered as Spanish 423. Not offered every year.
Mr. Urrutibeheity

425a/b. Romance Linguistics (3-0-3).
Also offered as Spanish 575. Not offered every year.
Mr. Urrutibeheity

433a/b. Structure of the German Language (3-0-3).
Synchronic study of modern German phonology, syntax, and semantics, including aspects of discourse structure. Also offered as German 403. Not offered every year.
Mr. Copeland

434a/b. History of the German Language (3-0-3).
Aspects of the history of German phonology, syntax, and semantics (with related systems) from its Proto-Indo-European origins to the present. Also offered as German 404. Not offered every year.
Mr. Copeland

440a. The Chinese Novel (3-0-3).
An exploration via translation into the symbolic and structural world of the traditional Chinese novel. The structural principles, symbolism, and aesthetic assumptions in China's rich literary tradition, with special attention given to the greatest of all Chinese novels, *Dream of the Red Chamber.*
Ms. Chen

443b. Chinese Linguistics (3-0-3).
Not offered every year.
Ms. Chen

467a. Computational Projects (3-0-3).
Mr. Lamb

470a. Language Description (3-0-3).
Theory and practice of describing linguistic and conceptual systems.
Mr. Lamb

481a,b. Independent Study (3-0-3).
Mr. Davis, Mr. Copeland

482a,b. Independent Study (3-0-3).
Ms. Chen, Mr. Lamb

500a. Linguistic Analysis (3-0-3).
Techniques of linguistic analysis and description.
Mr. Copeland

501b. Phonology (3-0-3).
See Linguistics 301.

502b. Syntax and Semantics (3-0-3).
See Lingusitics 402.
Mr. Davis

503a. Modern Linguistic Theory (3-0-3).
See Linguistics 403.

506b. Cognitive Linguistics (3-0-3).
See Linguistics 306.
Mr. Lamb

507a. Field Techniques and Analysis (Credit variable).
See Linguistics 407.
Mr. Davis

508b. Field Techniques and Analysis (Credit variable).
Continuation of Linguistics 507.
Mr. Davis

515a. Information Structures (3-0-3)
Mr. Lamb

516b. Studies in Hispanic Linguistics (3-0-3).
Mr. Urrutibeheity

550a,b. Departmental Colloquium (1-0-1).
Faculty, graduate students, and invited guests meet weekly to present reports on current research or to discuss current issues in linguistics and semiotics.
Mr. Copeland

551b. Seminar in Phonology (3-0-3).
Mr. Lamb

552b. Seminar in Syntax and Semantics (3-0-3).
Mr. Davis

567b. Computational Projects (3-0-3).
Mr. Lamb

581a. Graduate Research (Credit variable).
Mr. Copeland

582b. Graduate Research (Credit variable).
Mr. Copeland

583a. Graduate Research (Credit variable).
Mr. Lamb

584b. Graduate Research (Credit variable).
Mr. Lamb

585a. Graduate Research (Credit variable).
Mr. Davis

586b. Graduate Research (Credit variable).
Mr. Davis

587a. Graduate Research (Credit variable).
Mr. Mitchell

588b. Graduate Research (Credit variable).
Mr. Mitchell

589a,b. Graduate Research (Credit Variable).
Ms. Chen

590a,b. Teaching Linguistics (Credit variable).
Mr. Copeland

800a,b. Graduate Research (Credit variable).
Mr. Davis

Managerial Studies

Degree Offered: B.A.

Undergraduate Program. Students majoring in managerial studies are required to take the following ten courses: Accounting 305, Computer Science 100, Economics 211 and 448, Mathematical Sciences 280 and 376, Political Science 309 and 310, and Psychology 101 and 231. Students may satisfy the Computer Science and Mathematical Sciences required courses by alternatives. In addition, students must take five electives from a list of approved courses in Accounting, Computer Science, Economics, Mathematical Sciences, Political Science, and Psychology. All prospective majors should obtain the program information sheets and advising notes from the Program Director, Dr. Stephen A. Zeff, 352 Herring Hall, for full particulars about the major.

Managerial Studies Courses

495a. Senior Honors Thesis (3-0-3).
Completion of senior honors thesis. Open only to seniors in the managerial studies honors program.

Mr. Zeff

496b. Senior Honors Thesis (3-0-3).
See Managerial Studies 495.

Mr. Zeff

497a. Independent Study (3-0-3).
Independent study on an approved project under faculty supervision. Enrollment by special permission.

Mr. Zeff

498b. Independent Study (3-0-3).
See Managerial Studies 497.

Mr. Zeff

Mathematics

Professor Harvey, *Chair*
Professors Bryant, Curtis (Emeritus), Hempel, B.F. Jones, Polking, Semmes, Veech, and Wells
Associate Professor Boshernitzan
Assistant Professors Forman, Gao, and Poon
Instructors Galicki, Garrity, and Smith

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. There are two programs for students majoring in mathematics.

1. *Regular major.* Mathematics 101, 102 or 121, 122 and 211, 212 or 221, 222 and at least 24 semester hours (eight courses) in courses numbered 300 or above in the Department of Mathematics. Student can receive advanced placement credit

for Mathematics 101 by achieving a score of 4 or 5 on the AP AB level test or for Mathematics 101 and 102 by achieving a score of 4 or 5 on the BC level test. Students who have had calculus but have not taken the AP test may petition the Department of Mathematics for a waiver of the calculus requirements for a major in mathematics. Entering students are encouraged to enroll in the most advanced course commensurate with their background.

2. *Double major.* The requirements for the double major are the same as above with the exception that up to nine of the 24 semester hours numbered 300 or above can be replaced by approved mathematics-related courses.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Graduate Program. Admission to graduate study in mathematics will be granted to a limited number of students who have indicated ability for advanced and original work. Normally, one or two years are required after the bachelor's degree to obtain an M.A. degree and three or four years to obtain a Ph.D. An M.A. is not a prerequisite for the Ph.D.

A number of graduate scholarships and fellowships are available and will be awarded on the basis of merit. As part of the graduate education in mathematics, each graduate student is normally expected to engage in teaching or other instructional duties. Generally, less than six hours a week is devoted to such duties.

Qualifying Examinations. The qualifying examinations in mathematics consist of two parts: the general examination and the advanced examination.

1. *General examination.* It consists of three parts, covering algebra, analysis, and topology. The examination will be given twice a year, in mid-September and in mid-January. A student should take this examination after the third semester of graduate study or sooner. A student who fails one or more parts of the general examination may, with the approval of the departmental graduate committee, be allowed to retake the appropriate part(s) at the next scheduled examination time. A student generally will not be allowed to take any part of the general examination more than two times.
2. *Advanced oral examination.* After completing the general examination, the student should prepare for an advanced oral examination by selecting some special field (e.g., homotopy theory, several complex variables, group theory, etc.) and submitting the topic to the departmental graduate committee for approval. The time of the advanced examination will be scheduled by the graduate committee and will normally be within six to nine months after the general examination. A student who fails the advanced examination may, with the approval of the graduate committee, be allowed to retake it (on the same or possibly a different topic) but will generally not be allowed to take the advanced examination more than two times.

Requirements for the Degree of Master of Arts:

1. Satisfactory completion (grade of "B" or better) of a course of study approved by the department and fulfillment of the general rules of the University (described on pages 111-113). Transfer of credits from another university will be allowed only when approved by both the department and the University Graduate Council.
2. Satisfactory performance on an examination in at least one approved foreign language (French, German, or Russian).

Other requirements for the master's degree may be satisfied in either of the following ways:

1. Completion of all the requirements for qualification as a candidate for the doctoral degree as given below.
2. Presentation and oral defense of an original thesis acceptable to the department.

Requirements for the Degree of Doctor of Philosophy:

1. Satisfactory completion (grade of "B" or better) of a course of study approved by the department. Transfer of credits from another university will be allowed only when approved by both the department and the University Graduate Council.
2. Satisfactory performance on both the general and advanced qualifying examinations described above.
3. Satisfactory performance on examinations in two approved foreign languages (French, German, or Russian).
4. The writing of an original thesis acceptable to the department.
5. Satisfactory performance on a final oral examination on the thesis.
6. Any other conditions required by the general rules of the University (described on pages 111-113).

Mathematics Courses

101a,b. Single Variable Calculus I (4-0-4).
Differentiation, extrema, Newton's method, integration, fundamental theorem of calculus, area, volume, natural logarithm, exponential.

102a,b. Single Variable Calculus II (4-0-4).
Techniques of integration, arc length, surface area, Simpson's rule, L'Hopital's rule. Infinite sequences and series, tests for convergence, power series, radius of convergence. Students may receive credit for only one of 101, 111, 121 and also for only one of 102, 122.

111a. Introduction to Calculus and Its Applications I (3-0-3).
Emphasis on problem solving and applications. Topics of 111, 112 are those of 101, 102. Not intended for science or engineering students. However, students who need a slower development of calculus may receive credit for 111, 112, and 102.

112b. Introduction to Calculus and Its Applications II (3-0-3).

121a. Honors Calculus I (4-0-4).
Covers the material of Mathematics 101,102 with more emphasis on theoretical aspects. Prerequisite: departmental permission.

122b. Honors Calculus II (4-0-4).
See Mathematics 121.

211a,b. Ordinary Differential Equations (4-0-4).
Separable equations, first order linear equations, nth order linear equations with constant coefficients, Laplace transforms. Vector spaces, dimension, eigenvalues and eigenvectors of matrices. Systems of linear first order differential equations, exponential of a matrix. Qualitative theory of nonlinear systems. Prerequisite: Mathematics 102.

212a,b. Multivariable Calculus (4-0-4).
Gradient, divergence, and curl. Lagrange multipliers. Multiple intergrals. Spherical coordinates. Line integrals, conservative vector fields, Green's theorem, Stokes' theorem, Gauss' theorem.

221a. Honors Calculus III (3-0-3).
This course and Mathematics 222 include the material of Mathematics 212 and more. Topology of R^n, calculus for functions of several variables, linear and multilinear algebra, theory of determinants, inner product spaces, exterior differential calculus, integration on manifolds. Existence theorems for ordinary differential equations. Prerequisite: Mathematics 122 or permission of department. A student may not receive credit for Mathematics 222 and 212.

222b. Honors Calculus IV (3-0-3).
See Mathematics 221.

312b. Principles of Analysis (3-0-3).
A careful treatment of the topology of R^n, convergence of sequences and series of functions, the implicit function theorem, existence theorems for ODEs, and related topics. Not open to students with Mathematics 222.

355a. Linear Algebra (3-0-3).
Linear transformations and matrices, solution of linear equations, eigenvalues and eigenvectors, quadratic forms, rational canonical form, Jordan canonical form.

356b. Abstract Algebra (3-0-3).
Groups: normal subgroups, factor groups, Abelian groups. Rings: ideals, Euclidean rings, and unique factorization. Fields: algebraic extensions, finite fields. Students may not take this course and Mathematics 463.

365a. Number Theory (3-0-3).
Properties of numbers depending mainly on the notion of divisibility. Continued fractions. Offered alternate years. Offered 1988-89.

366b. Projective Geometry (3-0-3).
Basic elements of classical projective geometry: projective spaces, subspaces, incidence relations, comparison with other geometries. Offered alternate years. Offered 1987-88.

381a. Analysis and Applications (3-0-3).
Laplace transform: inverse transform, applications to constant coefficient differential equations. Boundary value problems: Fourier series, Bessel functions, Legendre polynomials. A student may not receive credit for this course and Mathematical Sciences 340.

382b. Complex Analysis (3-0-3).
Cauchy integral theorem, Taylor series, residues, evaluation of integrals by means of residues, conformal mapping, application to two-dimensional fluid flow. A student may not receive credit for this course and Mathematics 427 or Mathematical Sciences 330.

401a. Differential Geometry (3-0-3).
Differentiable manifolds, Stokes' theorem and deRham's theorem, fundamental theorem of local Riemannian geometry, Lie groups, vector bundles, affine connections.

402b. Differential Geometry (3-0-3).
See Mathematics 401.

423a. Partial Differential Equations (3-0-3).
Theory of distributions. Wave equation, Laplace's equation, heat equation. Fundamental solutions. Other topics include first order hyperbolic systems, Cauchy-Kowalewski theorem, potential theory, Dirichlet and Neumann problems, integral equations, elliptic equations.

424b. Partial Differential Equations (3-0-3).
See Mathematics 423.

425a. Real Analysis (3-0-3).
Lebesgue theory of measure and integration.

426b. Topics In Real Analysis (3-0-3).
Topics vary. Past topics include: Fourier series, harmonic analysis, probabilty theory, advanced topics in measure theory, ergodic theory.

427b. Complex Analysis (3-0-3).
Cauchy-Riemann equations, power series, Cauchy's integral formula, residue calculus, conformal mappings, special topics such as the Riemann mapping theorem, elliptic function theory.

443a. General Topology (3-0-3).
Basic point set topology. Includes set theory, well ordering. Metrization.

444b. Geometrical Topology (3-0-3).
Introduction to algebraic methods in topology and differential topology. Elementary homotopy theory. Covering spaces.

463a. Algebra I (3-0-3).
Groups, rings, fields, vector spaces. Matrices, determinants, eigenvalues, canonical forms, multilinear algebra. Structure theorem for finitely generated abelian groups. Galois theory.

464b. Algebra II (3-0-3).
See Mathematics 463.

490a,b. Supervised Reading (Variable).

502b. Topics in Differential Geometry (3-0-3).
The Atiyah-Singer Theorem, Secondary Invariants, and related topics.

517a. Mathematical Physics (3-0-3).
Supermanifolds and Super Lie Algebras.

525a. Topics in Complex Analysis (3-0-3).

526b. Topics in Complex Analysis (3-0-3).

800a,b. Thesis and Research (Variable).

Military Science

Professor Livaudais, *Chairman*
Adjunct Professor Slayton

The Department of Military Science is chaired by a United States Army officer, assisted by officers and noncommissioned officers of the U.S. Army assigned to the Houston Area ROTC Instructor Group. Training in military leadership and management is emphasized with instruction given in subjects common to all branches of the U.S. Army. Eligible students have the option of completing Reserve Officers' Training Corps courses in either a four-year or a two-year program.

Graduates of the Army ROTC program are commissioned in the Regular Army, Army Reserve, or National Guard in the various branches of the U.S. Army based on the needs of the Army, academic discipline, personal preference, recommendation of the professor of military science, demonstrated ability, and prior military training or experience.

Four-Year Program. The four-year program consists of the Basic Course (Military Science I and II), taken during the first and second years, and the Advanced Course (Military Science III and IV), taken during the third and fourth years.

Two-Year Program. Students with two years of study remaining who have not participated in the Basic Course are eligible for the two-year program. Students must successfully complete the six-week Basic Camp at Fort Knox, Kentucky, during the summer to qualify for the Advanced Course. The Basic Camp substitutes for Military Science I and II. Veterans who have served on active duty for at least two years may enroll in the Advanced Course without taking the Basic Course.

Advanced Camp. All students in the Advanced Course must attend a six-week Advanced Camp at Fort Riley, Kansas, between their junior and senior years. Each student is paid approximately $600 for the six-week period.

Leadership Laboratory. All students in the Reserve Officers' Training Corps (ROTC) program must participate in a weekly, two-hour leadership laboratory. A lab fee of $12.50 per semester is required.

Scholarships. Two-, three- and four-year scholarships are available on a competitive basis to students who participate in the Army ROTC program. Special two- and three-year scholarships are available for nonenrolled students. Each scholarship student receives $100 per month with all tuition, fees, books, and equipment paid for by the Army for the period of the scholarship.

Nonscholarship Students. Nonscholarship students receive $100 per month during the Advanced Course.

Military Science Courses

101a,b. Defense Establishment and National Security(1-2-1).
An introduction to the customs, courtesies, and organization of the U.S.Army. A study of the Department of Defense and the U.S. Army's role in current world affairs. Military skills leadership laboratory is required.

Mr. Livaudais

106a,b. Pistol and Rifle Marksmanship (2-2-0).
The development of rifle and pistol marksmanship skills to include safety, aiming,sighting, steady hold, and the basic firing positions. Military skills leadership laboratory required for ROTC enrolled students.

Staff

201a. Basic Tactics and Military Operations (3-2-1).
An introduction to small unit tactics, wargaming, and map reading. Military skills leadership laboratory required.

Mr. Livaudais

202b. Management of the Military (2-2-1).
A study of training management, oral communication skills, and the role of the professional soldier. Military skills leadership laboratory required.

Mr. Livaudais

301a. Advanced Tactics and Military Operations(3-2-2).
Military planning, operations, advanced tactics and wargaming. Prerequisite: basic course qualification or consent of chairman. Military skills leadership laboratory required.

Mr. Livaudais

302b. Leadership Development (3-2-2).
The study of individual and group behavior and the principles and techniques of applied leadership. Prerequisite: Military Science 301 or consent of chairman. Military skills leadership laboratory required.

Mr. Livaudais

401a. Professional Ethics and Military Justice(3-2-2).
A study of the military justice system, aspects of military law, the Geneva Convention, and military professionalism/ethics. Prerequisites: Military Science 301 and 302 or consent of chairman. Military skills leadership laboratory is required.

Mr. Livaudais, Mr. Slayton

402b. Management of the Military Team (2-2-1).
A study of the combined arms team, command and staff relationships, and army support organizations. Prerequisite: Military Science 401 or consent of chairman. Military skills leadership laboratory is required.

Mr. Livaudais

The Shepherd School of Music

Professor Hammond, *Dean*
Professors Arad, Babikian, Cooper, Fliegel, Holloway, S. Jones, Milburn, Luca, Norris, Schnoebelen, Tipton, and Trepel
Visiting Professor McKinley
Associate Professors Burt, Citron, Ellison, Gottschalk, and Pickar
Assistant Professors Arbiter, Bailey, R. Brown, Lavenda, and Meconi
Lecturers DeWitt, Dye, Kirk, Malone, and Rose
Artist Teachers Addison, Atherholt, Bacon, Brooks, Caballero, Chaisson, Connelly, Griebling, Kamins, Lombard, Mayer, Newton, Page, Perry, Shank, Walp, and Waters
Artists in Residence Bible and Comissiona
Melon Postdoctoral Fellow in the Humanities Andrews
Adjunct Lecturer Visser

Degrees Offered: B.A.; B.Mus.; B.Mus./M.Mus, (simultaneously); M.Mus.; D.M.A.

The Shepherd School of Music is committed to the highest quality education of musicians and offers both professional training and a broad liberal arts curriculum at the undergraduate level. At the graduate level, it offers professional music training for qualified students in programs of performance, creativity, and scholarship.

Degrees Offered. The Shepherd School of Music offers four degrees: Bachelor of Arts degree in music; the Bachelor of Music degree in performance, composition, music history, and music theory; the Master of Music degree in performance, composition, choral and instrumental conducting, musicology, and music theory; and the Doctor of Musical Arts degree in composition and selected areas of performance. Normally, four years are required for the bachelor's degrees and two years for the master's. Qualified students may elect an honors program that leads to the simultaneous awarding of the Bachelor of Music and Master of Music after five years of study.

Admission. An audition, either in person or on tape, and a theory evaluation are required of each undergraduate applicant. Undergraduate admission is determined jointly by the Shepherd School faculty and by the Admissions Committee of Rice University, which bases its evaluation upon successful academic achievement and standard college admission indices.

Transfer students from other colleges, conservatories, and universities are evaluated in terms of prior preparation, which may reduce the required period of study at Rice. An audition, personal or taped, and placement exams in both music history and music theory are required of transfer applicants.

An audition or personal interview, and placement exams in music history and music theory are required of graduate applicants. The Graduate Record Examination, including the advanced music tests, is required of graduate applicants in musicology, theory, and composition.

Curriculum Design. Undergraduate curricula consist of core music courses, applied music, other required music courses, chamber music and large ensembles, non-music courses as specified by the University, and electives. Music majors are entitled to one hour of private lessons each week each semester they are enrolled as a music major. Private or group lessons beyond this may result in additional fees. After the required four semesters of instrumental or vocal study, students in the B.A. in music program who wish to continue taking private lessons must secure permission. All undergraduate majors are required to take the following core courses:

Music Theory: 211, 212, 311, 312, 411
Music History: 221, 222, 321, 322, 421
Aural Skills: 231, 232, 331, 332, 431

Students in the B.A. in music program take all of the above, with the exception of Aural Skills 331, 332, and 431. Requirements in other music areas vary with the degree program. Further information on curricular requirements for all majors and degree programs may be obtained from The Shepherd School of Music.

The 36 course hours required by the University appears under the title "University Distribution Requirements" elsewhere in this catalog. For music majors, 6 hours of music history may be counted as humanities (Group 1, 2).

The B.Mus./M.Mus. program includes the core curriculum and an advanced curriculum. The first five semesters parallel the core curriculum of the four-year degrees. The sixth semester is a transitional semester in which the student must qualify for formal admission to candidacy for the master's degree as well as begin work in the advanced curriculum. If qualifying does not take place by the end of the sixth semester, the student is not allowed to register for the advanced curriculum without special permission. At least five distribution courses (preferably six) must be completed by the end of the sixth semester before the student is considered for formal admission to candidacy for the master's degree.

The final two years are devoted to the advanced curriculum, in which the student concentrates on creativity, performance, or research supported by laboratory or performing ensembles, theory and history seminars, and professional apprenticeships. Apprenticeships may involve a diversity of professional activities as appropriate for the individual. These may include participation with major or civic orchestras, choirs, or opera theaters; off-campus solo and small ensemble performances; conducting apprenticeships with professional orchestras, operas, or ballet companies; composition for films, television, public schools, and for ensembles in residence; and research in major national and international libraries. It is the responsibility of students to arrange their apprenticeships. Whenever possible, faculty members assist students in making arrangements for apprenticeships. These and any other specialized studies must be engaged by the individual student with the approval of the faculty.

Special Examinations:

1. At the end of each semester, a jury examination is given in applied music over the material studied during the semester.
2. Keyboard proficiency is required of all degree candidates except B.A. students and must be satisfied by examination. If the student has little or no knowledge of the keyboard, enrollment in secondary piano beginning in the student's first semester is required until the examination requirements are met.
3. Students on four-year undergraduate degree programs take, at the end of the fourth semester, an examination in aural skills to determine continuance on their degree program.
4. Students on the five-year program must take a qualifying examination no later than the sixth semester to determine admissibility to the student's preferred major area in the advanced curriculum. For performance majors, this examination

consists of the qualifying recital and an oral examination in music history and music theory based on the compositions to be performed on the qualifying recital. The Graduate Record Examination is required by the conclusion of the sixth semester for music history, theory, and composition majors.

Performance and Large Ensembles. Students are expected to perform frequently during their residence at Rice. Performance majors must present at least two full recitals. Composition and conducting students are expected to present recitals as specified by their degree programs. Students are expected to attend both faculty and student recitals. In addition, all music majors are required to participate in the school's conducted ensembles as assigned.

Thesis. The master's degree for composition, conducting, music history, and theory majors assumes a high level of scholarship. A thesis is required of music history and theory majors. An original work of extended scope is required of composition majors. Conducting majors must present either an extended composition or project.

Warning, Music School Probation, Discontinuation. A student performing unsatisfactorily in one or more courses at the midterm period may be placed on warning. If at the end of the semester significant improvement has not been shown, the student may be placed on music probation. A student may be placed directly on probation without warning. Probation is a more serious status than warning, and it signifies that the student's work has been sufficiently unsatisfactory to preclude graduation unless significant improvement is achieved promptly. A student on music probation may be absent from class only for extraordinary reasons and may not represent the school in any public function not directly a part of a degree program.

If at the conclusion of the probationary period the student has not shown marked improvement, the student may be discontinued from the school as a music major. Any student discontinued as a music major but not on academic suspension may elect a major elsewhere in the University, subject to the requirements of the major department or school.

A minimum grade of B- is expected of all music students in their major applied area. A grade of C will be evaluated in the following manner. If in the first five semesters of an undergraduate degree program a student receives a grade of C in his applied area, he will be placed on music warning. If the student receives a second C, he will be placed on music probation. With a third C in his major applied area, the student will be discontinued as a music major.

Courses for Non-majors. Non-majors will find the following courses designed for the general student: Music 117, 118; 224; 225; 307, 308; 317, 318; 327, 328; 334, 335; individual instruction in all instruments: Music 151-197.

In addition, other music courses may be taken by the non-major with the permission of the instructor and approval of the Dean of the Shepherd School.

Musical Opportunities. Musical and educational opportunities are afforded the student both on campus and in the greater Houston area. A visiting lecturer series, a professional concert series, and numerous visiting distinguished musicians contribute to the Shepherd School environment. The Houston Symphony Orchestra, Symphony Chorale, Houston Grand Opera, Texas Opera Theater, Houston Ballet, Concert Chorale of Houston, Texas Chamber Orchestra, as well as the activities of other institutions of higher learning in the area provide exceptional opportunities for musical experiences.

Composition

Music Courses

201a. Composition I (3-0-3).
Creative composition employing midcentury vocabularies supported by extensive performance, listening, and analysis of related scores. Prerequisite: permission of instructor.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

202b. Composition II (3-0-3).
Creative composition employing current musical vocabularies, supported by appropriate performance, listening, and analysis.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

301a. Composition III (3-0-3).
Composition for solo instruments and small ensembles.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

302b. Composition IV (3-0-3).
Composition for four to six instruments and/or voices.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

303a, 304b. Undergraduate Composition Seminar I, II (Credit variable).
Mr. Gottschalk

305a, 306b. Composition Elective (3-0-3 each semester).

307a, 308b. Composition for Nonmajors I, II (3-0-3 each semester).

401a, 402b. Composition V, VI (3-0-3 each semester).
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

405a, 406b. Composition Elective (3-0-3 each semester).

407. Music for Film (2 credits).
Lectures focusing on instances where music has made a decisive impact on the meaning and vitality of various films. Generalized functions of film music (pacing, characterization, psychological extension, structural delineation) are examined with reference to dramatic intent. No prior technical knowledge of either medium is assumed. Explanation or definition is offered where needed. Some background in film or music is preferred.
Mr. Burt

408. Film Music Lab (1 credit).
Discussions centering on detailed analysis of specific "cues" with the goal towards a collaboration with a filmmaker on the composition of a sound track for a short film. Lab is open to composers and is to be taken concurrently with Music 407.
Mr. Burt

501a, 502b. Advanced Composition I, II (3-0-3 each semester).
Composition for large ensembles.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

503a, 504b. Electronic Music Composition (1-6-3 each semester).
Mr. Gottschalk

505. Composition for Media (1-6-3).
Offered irregularly.
Mr. Milburn

601a, 602b. Advanced Composition III, IV (3-0-3 each semester).
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

603a, 604b. Graduate Composition Seminar I, II (Credit variable).
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

701, 702. Advanced Composition V, VI (3 credits).
Advanced composition for doctoral students.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

703, 704. Advanced Composition VII, VIII (3 credits).
Advanced composition for doctoral students.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

705, 706. Advanced Composition IX, X (3 credits).
Advanced composition for doctoral students.
Mr. Burt, Mr. Cooper, Mr. Gottschalk, Mr. Jones, Mr. Milburn

707. Doctoral Independent Study in Composition (3 credits).
Major symphonic or symphonic/choral work of professional level.
Staff

711. Analytical Approaches (3 credits).
An examination of critical passages from chosen works and with specific reference to central points of view in the writings of Schenker, Forte, Babbitt, Cone.
Mr. Burt

Theory

Music Courses

111a. Theoretical Studies I (3-0-3).
For music majors. Fundamentals, part-writing, analytical techniques. Examples drawn from diverse musical periods.

112b. Theoretical Studies II (3-0-3).
For music majors. Continuation of Music 111. Introduction to counterpoint, orchestration, and form.

117a,b. Fundamentals of Music I (3-0-3).
For nonmusic majors with minimal music preparation. Rudiments of pitch and duration. Study of scales, chord structure tonality, and forms.

118b. Fundamentals of Music II (3-0-3).
Application of Music 117 materials. Creative work utilizing twentieth-century art and popular vocabulary.

211a. Honors Theory I (3-0-3).
For music majors. Theory evaluation survey is required prior to admission to class. Study of music aesthetics, physical properties of sound, melody rhythm, counterpoint, instrumentation, and form. Study of and creative work in music of the late Medieval period and the Renaissance.
Mr. Lavenda

212b. Honors Theory II (3-0-3).
For music majors. Discussion, analysis, and creative application of theoretical concepts and vocabulary from 1700 to 1950.
Mr. Lavenda

311a. Theoretical Studies III (3-0-3).
For music majors. Baroque and Early Classical music. Study of species counterpoint and of two-three-four voice tonal counterpoint. Analysis of representative compositions of diverse genre and medium.
Mr. Gottschalk

312b. Theoretical Studies IV (3-0-3).
For music majors. Late Classical and Romantic music. Continued study of tonal counterpoint. Instrumentation and orchestration. Analysis of selected major works.
Mr. Gottschalk

317a. Theory for Nonmajors I (3-0-3).
For nonmusic majors with appreciable instrumental and/or high school theory background. Discussion, analysis, and application of the parameters of music: melody, rhythm, harmony, counterpoint, instrumentation, and form. Application to literature to 1700.

318b. Theory for Nonmajors II (3-0-3).
For nonmusic majors with appreciable instrumental and/or high school theory background. Prerequisite: 317 or permission of instructor. Stylistic harmony, melody, and form from 1700 to the present.

411a. Theoretical Studies V (3-0-3).
Music of the twentieth century. Counterpoint and orchestration, employing twentieth-century vocabulary and techniques. Analysis of selected major works.
Mr. Milburn

412b. Theoretical Studies VI (3-0-3).
Advanced analytical techniques. Practical applications of principal analytical systems from the Middle Ages to the present.
Mr. Jones

414b. Acoustics (3-0-3).
Mr. Gottschalk

511a. Graduate Theory Review (2-0-2).
Mr. Burt

513a. Modal Counterpoint (2-0-2).
Mr. Gottschalk

515a, 516b. Advanced Orchestration I, II (2-0-1 each semester).
Mr. Jones, Mr. Milburn

517a. Special Studies-Music Theory Analytical Systems (3-0-3).
Mr. Andrews

611a, 612b. Pedagogy of Theory I, II (3-0-3 each semester).
Principal learning theories and philosophies of learning and teaching. Examination and critique of college-level materials.
Mr. Milburn

613b. Canon and Fugue (2-0-2).
Specialized study of imitative counterpoint. Examples from the fifteenth to twentieth centuries. Emphasis on the Baroque fugue.
Mr. Milburn

614a,b. Selected Studies in Music Theory (3-0-3).
Advanced study of the music of a single composer..
Mr. Milburn

715a. History of Theory (3-0-3).

History and Literature

Music Courses

221a, 222b. Historical Studies I, II (3-0-3 each semester).
Historical study of musical style. The Middle Ages to 1700, first semester; 1700 to the present, second semester.

Ms. Meconi

224b. Introduction to Opera (3-0-3).
Introductory course focusing on historical, musical, and literary aspects of selected operas, including thsoe in Houston Grand Opera current session. No prerequisite. Offered irregularly.

Ms. Schnoebelen

321a, 322b. Historical Studies III, IV (3-0-3 each semester).
Advanced historical studies in music of the seventeenth, eighteenth, and nineteenth centuries. Baroque, Pre-Classical, first semester; Classical and Romantic, second semester. Correlated with Music 311, 312 and 331, 332.

Ms. Schnoebelen, Ms. Citron

325. Baroque String/Continuo Performance (credit variable).
This course combines the theoretical and pragmatic approaches to Baroque music performance problems for string and continuo players. Research from treatises on various topics will be discussed in weekly classes and then applied to the instruments in extensive performance workshops. Prerequisite: audition.

Mr. Luca, Ms. Schnoebelen

327a, 328b. Music Literature for Nonmajors I, II (3-0-3 each semester).
Historical survey of music from the Middle Ages to 1750, first semester; from 1750 to the present, second semester.

Mr. Bailey

329b. Special Studies-Music History. (3-0-3).
Special studies in music history.

Ms. Citron

421a. Historical Studies V (3-0-3).
Twentieth century and contemporary. Advanced historical studies in music of the twentieth century. Correlated with Music 411 and 431.

Mr. Bailey

422b. Renaissance Music (3-0-3).

Ms. Schnoebelen

423a. Chamber Music Literature (3-0-3).
Offered irregularly.

Ms. Norris

424a, 425b. Organ Literature I, II (3-0-3 each semester).

Mr. Holloway

426a. Piano Literature (3-0-3).

Ms. Norris

427a, 428b. Organ Literature III, IV (3-0-3).

Mr. Holloway

429. Music of the Middle Ages (3-0-3).
Offered irregularly.

436a,b. Collegium (1 credit)

Ms. Meconi

521. Graduate Review of Early Music (0 credit).

Ms. Schnoebelen

523a. Bibliography and Research Methods I (3-0-3).
Techniques in research methodology, studies in bibliography.

Ms. Schnoebelen

524b. Bibliography and Research Methods II (3-0-3).
Prerequisite: Music 523 or permission of instructor. Offered irregularly.

Ms. Schnoebelen

525. Performance Practices Seminar (3-0-3)
Study of performance practices from treatises and music, problems in editing music. Offered irregularly.

Staff

621a,b. Selected Studies in Music History-Opera as Drama (3-0-3).
Seminar on individual topics in music history to be announced each year. Prerequisite: Music 411, 421.

Ms. Citron

624a,b. Seminar on a Selected Composer-Beethoven (3-0-3 each semester).
Advanced study of the music of a single composer.

Ms. Schnoebelen

725, 726. Notation I, II (3-0-3 each semester).
Prerequisite: permission of instructor, Offered irregularly.

Staff

Aural Skills

231a. Aural Skills and Performance Techniques I (3-0-2).
Ear-training and sight-singing: solfege, rhythmic studies, intervals, chords. Literature through about 1700.

Ms. Citron

232b. Aural Skills and Performance Techniques II (3-0-2).
Continuation of Music 231. Literature from about 1700 to the present.

Ms. Citron

331a, 332b. Aural Skills and Performance Techniques III, IV (3-0-2 each semester).
Continuation of Music 232. Also studies in performance techniques: intonation, phrasing, improvisation, performance practice. First semester: baroque. Second semester: classic/romantic.

Mr. Tipton

431a. Aural Skills and Performance Techniques V (3-0-2).
Continuation of performance techniques. Literature of the twentieth century.

Mr. Tipton

437a. Graduate Ear Training Review (3-0-2).
Offered irregularly.

Conducting

333a,b. Undergraduate Conducting Seminar (4-0-1).

433b. Score Reading (2-2-2).

Mr. Jones

434a. Elements of Conducting (2-0-2).

Mr. Jones

439a. Choral Conducting I (3-0-3).
The fundamentals skills of choral conducting, including baton techniques, score reading, and rehearsal procedures. Conducting materials will be selected from representative choral works. Offered irregularly.

Mr. McKinley

440b. Choral Conducting II (3-0-3).
Advanced techniques of choral conducting with emphasis on expressive gestures and phrasal conducting, interpretation and chironomy of chant, recitative conducting, repertoire selection, score preparation, and conducting of choral-instrumental works. Offered irregularly.

Mr. McKinley

533a,b. Graduate Conducting Seminar (4-0-1).

Mr. Jones

537a, 538b. Advanced Conducting I, II (3-9-3).

Mr. Jones

630a, b. Graduate Choral Conducting Seminar (3-0-3).

Mr. McKinley

637a, 638b. Advanced Conducting III, IV (3-9-3 each semester).

Mr. Jones

639b. Orchestra Administration (1-0-1).
Offered irregularly.

Mr. Jones

Individual Instruction

Course numbers for individual instruction are constituted as follows:

1. The first digit indicates function within the student's curriculum: 1 = nonmusic major; 2 = secondary, i.e., study by a music majors on an instrument other than her or his principal instrument; 3 = concentration, i.e., the principal instrument of students majoring in composition, music history, theory, or conducting; 4 = music performance major for four-year undergraduates and five-year students prior to qualifying exams; 6 = music performance major for two-year graduate students and five-year students after qualifying exams.
2. The second digit indicates the instrumental "family."
3. The third digit indicates the particular instrument within the family.

Course numbers for flute are printed in complete format below. The remainder is printed in summary form.

Woodwind Instruction

Flute Courses

151a,b. Flute for Nonmajors (1-5-2).

251a,b. Secondary Flute (1-5-2).

351a,b. Concentration Flute (1-5-2).

352a,b. Concentration Flute-Intensive (1-25-3).

Mr. Tipton

451a,b. Flute for Majors (1-25-3).

Mr. Tipton

651a,b. Flute for Majors, Advanced, and Graduates (1-25-3).

Mr. Tipton

Oboe Courses

153a,b (1-5-2); **253a,b** (1-5-2); **353a,b** (1-5-2); **354a,b** (1-25-3); **453a,b** (1-25-3); **653a,b** (1-25-3).

Mr. Atherholt

Clarinet Courses

155a,b (1-5-2); **255a,b** (1-5-2); **355a,b** (1-5-2); **356a,b** (1-25-3); **455a,b** (1-25-3); **655a,b** (1-25-3).

Mr. Pickar

Bassoon Courses

157a,b (1-5-2); **257a,b** (1-5-2); **357a,b** (1-5-2); **356a,b** (1-25-3); **457a,b** (1-25-3); **656a,b** (1-25-3).

Mr. Kamins

459. Theory of Woodwind Performance Techniques (1-3-1 each semester).
For non-woodwind students.

Mr. Pickar

559a,b. Woodwind Pedagogy (1-3-2 each semester).
Offered irregularly.

Brass Instruction

Horn Courses

161a,b (1-5-2; **261a,b** (1-5-2); **361a,b** (1-5-2); **362a,b** (1-25-3); **461a,b** (1-25-3); **661a,b** (1-25-33).

Trumpet Courses

163a,b (1-5-2); **263a,b** (1-5-2); **363a,b** (1-5-2); **364a,b** (1-25-3); **463a,b** (1-25-33); **663a,b** (1-25-3).

Mr. DeWitt, Mr. Walp

Trombone Courses

165a,b (1-5-2); **265a,b** (1-5-2); **365a,b** (1-5-2); **366a,b** (1-25-3); **465a,b** (1-25-3); **665a,b** (1-25-3).

Tuba Courses

167a,b (1-5-2); **267a,b** (1-5-2): **367a,b** (1-5-2); **368a,b** (1-25-3); **467a,b** (1-25-3); **667a,b** (1-25-3).

Mr. Kirk

469. Theory of Brass Performance Techniques (1-3-1 each semester).
For Non-brass students.

Staff

569a,b. Brass Pedagogy (1-3-2).
Offered irregularly.

Percussion Instruction

Percussion Courses

171a,b (1-5-2); **271a,b** (1-5-2); **371a,b** (1-5-2); **372a,b** (1-25-3); **471a,b** (1-25-3); **671a,b** (1-25-3).

Mr. Brown

479b. Theory of Percussion Performance Techniques (1-3-1 each semester).
For non-percussion students. Offered irregularly.

Mr. Brown

579a,b. Percussion Pedagogy (1-3-2 each semester).
Offered irregularly.

Mr. Brown

Voice Instruction

Voice Courses

173a,b (1-5-2); **273a,b** (1-5-2); **373a,b** (1-5-2); **374a,b** (1-25-3); **473a,b** (1-25-3); **673a,b** (1-25-33).

Ms. Babikian, Ms. Bible, Ms. Lombartd, Ms. Griebling, Ms. Newton

475. Theory of Vocal Performance Technique (1 credit).
For non-voice students. Offered irregularly.

Staff

549a,b. Voice Pedagogy (1-3-2 each semester).
Offered irregularly.

571. Vocal Coaching (1 credit).

Mr. Connelly

573a. Diction I: Italian (2-1-1).

Ms. Lombard

574a. Diction II: German (2-1-1).

Mr. Justen

575a, 576b. Voice Repertoire I, II (1-3-2 each semester).

Ms. Griebling

577b. Diction III: English (2-1-1).

Ms. Lombard

578b. Diction IV: French (2-1-1).

Mr. Justen

Keyboard and Harp Instruction

Piano Courses

181a,b (1-5-2); **281a,b** (1-5-2); **381 a,b** (1-5-2); **382a,b** (1-25-3); **481a,b** (1-25-3); **681a,b** (1-25-3).

Ms. Norris, Mr. Perry, Mr. Chaisson

Organ Courses

183a,b (1-5-2); **283a,b** (1-5-2); **383a,b** (1-5-2); **384a,b** (1-25-3); **483a,b** (1-25-3); **683a,b** (1-25-3).

Mr. Holloway

Harpsichord Courses

185a,b (1-5-2); **285a,b** (1-5-2); **385a,b** (1-5-2); **386a,b** (1-25-3).
Prerequisite: Permission of instructor.

Mr. Holloway

Harp Courses

187a,b (1-5-2); **287a,b** (1-5-2); **387a,b** (1-5-2); **388a,b** (1-25-3); **487a,b** (1-25-3); **687a,b** (1-25-3).

Ms. Rose, Ms. Page

445a, 446b. Keyboard Proficiency I, II (Credit variable each semester).
Offered irregularly.

Mr. Holloway, Staff

482. Piano Technology (2 crdits).
An introduction and practicum in the tuning and maintaining of pianos. Among the topics to be discussed will be the theory and acoustics of tuning, a brief history of the piano, proper repair and replacement of sound producing mechanisms, and a general exposure to restoration. There will be hands-on experience and opportunities for supervised involvement in tuning and maintenance. The course is designed primarily but not exclusively for piano majors.

Mr. Shank

545a, 546b. Keyboard Proficiency III, IV (Credit variable each semester).
Offered irregularly.

Mr. Holloway, Staff

546a. Organ Pedagogy (1-3-2).

Mr. Holloway

589a,b. Piano Pedagogy (1-3-2).
Offered irregularly.

Mr. Shank

645b. Organ Construction (Credit variable).
Offered irregularly.

String Instruction

Violin Courses

191a,b (1-5-2); **291a,b** (1-5-2); **391a,b** (1-5-2); **392a,b** (1-25-3); **491a,b** (1-25-3); **691a,b** (1-25-3).

Mr. Fliegel, Mr. Luca

Viola Courses

193a,b (1-5-2); **293a,b** (1-5-2); **393a,b** (1-5-2); **394 a,b** (1-25-3); **493a,b** (1-25-3); **693a,b** (1-25-3).

Mr. Arad, Mr. Brooks

Violoncello Courses

195a,b (1-5-2); **295a,b** (1-5-2); **395a,b** (1-5-2); **396a,b** (1-25-3); **495a,b** (1-25-3); **695 a,b** (1-25-3).

Ms. Trepel

Double Bass Courses

197a,b (1-5-2); **297a,b** (1-5-2); **397a,b** (1-5-2); **398a,b** (1-25-3); **497a,b** (1-25-3); **697a,b** (1-25-3).

499a. Theory of String Performance Techniques (1-3-1).
For non-string students. Offered irregularly.

Mr. Fliegel

599a,b. String Pedagogy (1-3-2 each semester).
Offered irregularly.

Ensembles

334a,b. Campanile (0-3-1 each semester).

Mr. Jones

335a,b. Undergraduate Chorus (0-3-1 each semester).
Section 1, Shepherd Singers (by audition only); Section 2, Rice Chorale.

Mr. McKinley

337a,b. Undergraduate Orchestra (0-9-1 each semester).

Mr. Mayer

338a,b. Undergraduate Chamber Music (0-6-1 each semester).
Section 1, String Quartet; Section 2, Piano; Section 3, Other String Ensembles; Section 5, Woodwind; Section 6, Brass; Section 7, Percussion; Section 8, Voice; Section 10, Other Ensembles.

435a,b. Contemporary Ensemble.

531a,b. Orchestral Repertoire (1-3-1 each semester).
May be repeated. Section 1, Violin; Section 2, Viola; Section 3, Cello; Section 4, Bass; Section 5, Woodwinds; Section 6, Brass; Section 7, Percussion; Section 8, Harp.

635a,b. Advanced Orchestra (0-9-1 each semester).

Mr. Mayer

636a,b. Advanced Chamber Music (0-6-1 each semester).
Section 1, String Quartet; Section 2, Piano; Section 3, Other String Ensembles; Section 5, Woodwind; Section 6, Brass; Section 7, Percussion; Section 8, Voice; Section 10, Other Ensembles.

640a,b. Advanced Chorus (0-3-1 each semester).
Section 1, Shepherd Singers (by audition only). Section 2, Rice Chorale.

Mr. McKinley

736a,b. Doctoral Chamber Music (0-6-1 each semester).
Section 1, String Quartet; Section 2, Piano; Section 3, Other String Ensembles; Section 5, Woodwind; Section 6, Brass; Section 7, Percussion; Section 8, Voice; Section 10, Other Ensembles.

Courses Applicable to All Specializations

341a,b. Junior Recital (0-0-0 each semester).

441a,b. Qualifying Recital (0-0-0 each semester).

442a,b. Recital Accompanying (0-2-1 each semester).
Accompanying a single student recital, including the preview, dress rehearsal, performance, three lessons with the soloist's teacher, and practice times mutually agreeable to soloist and accompanist. May be repeated for additional credit.

443a,b. Studio Accompanying (0-4-1 each semester).
Accompanying private lessons in studios as assigned for a total of four hours per week. May be repeated for additional credit.

449a,b. Undergraduate Independent Study (Credit variable).

641a,b. Advanced Recital (0-0-0 each semester).

642a,b. Accompanying for Ensemble Credit (0-4-1 each semester).
Requires permission of student's major teacher and conductor of ensemble in which student would normally perform. Taken in lieu of Music 635 or 640. Student to fulfill requirements of Music 442 or 443.

647a,b. Master's Thesis in Composition, Theory, History and Literature, or Conducting (1-0-3).

649a,b. Graduate Independent Study (Credit variable).

741a,b. Graduate Recital (0-0-0 each semester).

749a,b. Apprenticeship (Credit variable).

750. Doctoral Document (3 credits).
Supervised research and writing in areas of performance study. Not limited to areas of original research.

Staff

751. Doctoral Recital (0 credit).

800. Dissertation (3 credits).

Band

Band Courses

340b. Concert Band (0-4-1).

Mr. Dye

342a,b. Jazz Ensemble (0-3-1).
Mr. Dye

345a,b. Applied Studies in Jazz Improvisation (Credit variable).
Private lessons on specific advanced techniques in jazz improvisation.

415b. Band Arranging (2-1-1).
Creative band arranging for marching, jazz, and concert bands. Study of contemporary harmony, musical style, and scoring supported by practical performance and analysis of student projects.
Mr. Dye

Naval Science

Professor M. E. Sullivan, *Chair*
Associate Professor Steenburgh
Assistant Professors Sonntag, Downey, and Rachal

The Department of Naval Science is administered by a senior U.S. naval officer, assisted by officers and men of the U.S. Navy and Marine Corps.

There are two categories of NROTC students: (1) scholarship, (2) nonscholarship.

Scholarship Students. A scholarship NROTC student is appointed a midshipman, U.S. Naval Reserve, on a nationwide competitive basis and receives retainer pay at the rate of $100 per month for a maximum of four academic years, with all tuition, fees, books, and equipment paid for by the government. Midshipmen are required to complete prescribed naval science courses, participate in drills and three summer cruises, and, upon graduation with a baccalaureate or advanced degree, to accept a regular commission as ensign in the U.S. Navy or second lieutenant in the U.S. Marine Corps.

Nonscholarship Students. Nonscholarship students are civilian college students who enter into a mutual contract with the Secretary of the Navy in which they take naval science courses and participate in drills and one summer training cruise. In return, the Navy pays the student $100 per month during the junior and senior years and offers a reserve commission in the Navy or Marine Corps upon graduation. Nonscholarship students may, on a local, competitive basis, be recommended for scholarship status by the professor of naval science.

Two-Year Program Students. Interested students may, in their sophomore year (junior year for five-year students at Rice), apply for the two-year NROTC program. A nationwide competition will initially determine their scholarship or nonscholarship status (see above). Following selection, applicants attend a six-week Naval Science Institute (NSI) at Newport, Rhode Island, during July and August, which is designed to "make up" the first two years of the regular NROTC program. Successful completion of NSI qualifies the student for enrollment in the advanced NROTC on an equal footing with the

four-year students. About 15 percent of the nonscholarship students finishing NSI may be offered a two-year NROTC scholarship at that time. Additional scholarships may be awarded to the others from time to time upon the recommendation of the professor of naval science at Rice.

U.S. Marine Corps. NROTC students, either scholarship or nonscholarship, may apply for the Marine Corps program. Such selectees are referred to as Marine Corps option students and attend separate classes under a marine officer instructor during their junior and senior years.

Naval Science

Naval Science Courses

101a. Naval Orientation (2-2-0).
An introduction to naval traditions and customs, seamanship, naval organization and missions, and the fundamental concepts of seapower.

102b. Naval Engineering—Naval Ship Systems I (3-2-3).
A study of ship propulsion systems, refrigeration systems, steering systems, electrical power distribution, ship design, ship stability and damage control measures.
Mr. Downey

201a. Naval Weapons-Naval Ship Systems II (3-2-2).
A study of the theory and employment of weapons systems. The student explores the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. The physical aspects of radar and underwater sound are described in detail.
Mr. Downey

202b. Seapower and Maritime Affairs (3-2-2).
Readings, discussions, and research on selected topics related to the history, importance, and impact of seapower on modern civilization.
Mr. Sullivan

301a. Navigation (3-2-3).
A comprehensive study of coastal piloting, celestial and electronic ship navigation; involves nautical astronomy, navigational aids, satellite and inertial systems. Requires Naval Science 311 lab.
Mr. Rachal

302b. Naval Operations (3-2-3).
An analysis of ship movements, formations, and fleet operations; includes Rules of the Road, maneuvering board, tactical publications and communications.
Mr. Rachal

311a. Navigation Lab (0).
Mr. Rachal

401a. Leadership/Management I (2-0-2).
An introduction to the principles and concepts of management, organization, leadership, information systems, and decision making.
Mr. Steenburgh

402b. Leadership Management II (1-0-1).
A comprehensive study of leadership and management principles, with particular emphasis on the practical application of interviewing, counseling techniques, human resources management, military law and discipline, and organization administration.
Mr. Steenburgh

410b. Amphibious Warfare (3-2-1).
A study of the history of amphibious warfare. Case studies examine doctrine, tactics, and the factors necessary for successful operations.

Mr. Sonntag

In addition to the courses listed above, NROTC students may be required to complete certain other courses that are offered by the University.

Philosophy

Professor Grandy, *Chair*
Professors Brody, Engelhardt and Kolenda
Associate Professor Kulstad
Assistant Professors Crowell, Harrison, Stingl, Temkin, Warren, and Waters

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. The philosophy major requires 30 semester hours (ten courses); at least 18 semester hours (six courses) must be in the 300 level or above. Majors must take Philosophy 201, 202, either 306 or 307, one course in logic (either 106 or 305), and two further courses in the history of philosophy (301, 302, 308, 501, or 502). If the student wishes, metaphysics (Philosophy 304), theory of knowledge (Philosophy 303), or philosophy of language (Philosophy 353) may be substituted for one of these additional history courses. A double major requires 27 hours (nine courses) with all other requirements remaining the same.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of at least 24 semester hours in advanced courses approved by the department.
2. Satisfactory performance on a reading examination in one foreign language or 12 additional semester hours in advanced courses approved by the department.
3. Completion of a written thesis on a subject approved by the department.
4. Satisfactory performance on a final oral examination not limited to the student's special field of study.

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of 48 hours of course work approved by the department (including logic).
2. Satisfactory performance on a reading examination in one foreign language. Students whose research interests require a substantial knowledge of another discipline can petition to substitute for the language exam an examination in that other discipline.
3. Satisfactory performance on a qualifying examination.
4. Completion of a written thesis on a subject approved by the department; at least one year of thesis research must be spent in residence.
5. Satisfactory performance on a final oral examination, not limited to the student's special field of study.

Philosophy Courses

100a. Problems of Philosophy (3-0-3).
Survey of traditional and contemporary authors on such topics as the nature of scientific knowledge, the theory of justice, and the conflict between determinism and freedom.
Mr. Stingl

101a. Contemporary Moral and Legal Issues (3-0-3).
Examination of the moral and legal issues surrounding such topics as abortion, euthanasia, war, capital punishment, and equality of opportunity. Enrollment limited to 150.
Mr. Temkin

102b. Four Perspectives on the Meaning of Life: Existentialism, Marxism, Mysticism, Humanism (3-0-3).
Examination of contrasting orientations toward human life that emerge from the contemporary intellectual, social, and political situation.
Mr. Kolenda

103a. Philosophy and Psychology (3-0-3).
Examination of the interrelationship between philosophical and psychological thought.
Mr. Waters

104b. Philosophical Perspectives on Science (3-0-3).
Philosophical issues that arise in and about science; specific theories in both natural and social science analyzed to understand the nature and impact of scientific knowledge.
Mr. Waters

105a. Historical Introduction to Philosophy (3-0-3).
Study and discussion of central ideas of Western philosophy as developed by its original thinkers.
Mr. Kolenda

106b. Logic (3-0-3).
A system of natural deduction is used to establish the validity of arguments, the validity of which turns on their truth functional or quantificational form.
Ms. Harrison

201a. History of Philosophy I (3-0-3).
Survey of major philosophers of the ancient and medieval world from Thales to Ockham.
Mr. Warren

202b. History of Philosophy II (3-0-3).
A survey of the history of philosophy from the seventeenth to the twentieth century.
Mr. Kulstad
Mr. Crowell

301a. Ancient and Medieval Philosophy (3-0-3).
Survey of major philosophical writings from the fourth century B.C. through the fourteenth. Content varies from year to year.
Mr. Warren

302a. Modern Philosophy (3-0-3).
Examination of themes or authors in modern philosophy.
Mr. Engelhardt

303b. Theory of Knowledge (3-0-3).
Topics: analysis of knowledge, foundations of knowledge, skepticism, perception, etc. Prerequisite: one course in philosophy.
Mr. Kulstad

304b. Metaphysics (3-0-3).
Examination of some classical and contemporary metaphysical systems. Particular attention is paid to the very possibility of metaphysical analysis. Prerequisite: one course in philosophy.
Mr. Warren

305a. Mathematical Logic (3-0-3).
Natural deduction and semantical treatment of first order logic.
Mr. Grandy

306a. Ethics (3-0-3).
Philosophical analysis of traditional and contemporary theories of ethics.
Mr. Temkin

307b. Social and Political Philosophy (3-0-3).
What makes a society just? On what grounds may the liberty of individuals be legitimately limited? What social ends may a state legitimately pursue?
Mr. Stingl

311b. Philosophy of Religion (3-0-3).
Examination of God's existence, the problem of evil, the relation between faith and reason, and the varieties of religious experience. Offered alternate years.
Mr. Kolenda

312a. Philosophy of Mind (3-0-3).
Inquiry into the nature of mind with emphasis on the mind/body problem. Prerequisite: one course in philosophy.
Ms. Harrison

313a. Philosophy of Science (3-0-3).
Study of the relationship between scientific theories, experiment, observation, and reality. Prerequisite: one course in philosophy.
Mr. Waters

315b. Ethics, Medicine and Public Policy (3-0-3).
An examination of some of the ethical and policy questions raised by contemporary medical techniques and by contemporary modes for the delivery of medical services.
Mr. Engelhardt

318b. Philosophy in Literature (3-0-3).
Study of philosophical themes in selected works in English, French, German, and Russian literature.
Mr. Kolenda

353b. Philosophy of Language (3-0-3).
Philosophical investigation of relations among language, thought, and reality. Prerequisite: two courses in linguistics or philosophy. Also offered as Linguistics 353.
Mr. Stingl

390b. Contemporary Topics (3-0-3).
Prerequisite: Philosophy majors or permission of instructor.
Mr. Brody

401a. Independent Reading I (Variable).
Prerequisite: permission of the department.
Mr. Grandy

402b. Independent Reading II (Variable).
See Philosophy 401.
Mr. Grandy

501b. Seminar in Ancient Philosophy (3-0-3).
Mr. Warren

502a. Seminar in Modern Philosophy (3-0-3).
Mr. Kulstad

506b. Seminar in Ethics (3-0-3).
Offered alternate years.
Mr. Temkin

507a. Social and Political Philosophy (3-0-3).
Offered alternate years.
Mr. Stingl

508b. Seminar in Continental Philosophy (3-0-3).
Offered alternate years.
Mr. Crowell

512b. Seminar in Philosophy of Mind (3-0-3).
Offered alternate years.
Ms. Harrison

513b. Seminar in Philosophy of Science (3-0-3).
Offered alternate years.
Mr. Waters

522a. Pragmatism (3-0-3).
Offered alternate years.
Mr. Kolenda

530a. Frege to Logical Positivism (3-0-3).
Offered alternate years.
Mr. Brody

553b. Seminar in Philosophy of Language (3-0-3).
Mr. Grandy

601a. Advanced Independent Reading I (Variable).
Mr. Grandy

602b. Advanced Independent Reading II (Variable).
Mr. Grandy

800b,a. Research and Thesis (Variable).
Mr. Grandy

Physics

Professor Bonner, *Chair*
Professors S.D. Baker, Clayton, Duck, Dunning, Estle, Hannon, Huang, N.F. Lane, Michel, Mutchler, Phillips, Rau, J.B. Roberts, Rorschach, Stebbings, Trammell, and Walters
Adjunct Professors Hazlewood and Valkovic
Associate Professors Corcoran, Dodds, and Miettinen
Adjunct Associate Professor Chang
Assistant Professors Stevenson and Hulet

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. During the first two years, all physics majors, including those electing one of the five physics options listed below, normally take the following required courses:

Mathematics 101, 102, 211, 212 (or equivalent honors courses)
Physics 101, 102, 132, 201, 202, 231
Chemistry 101, 102, 107

At the end of the sophomore year each student will be assigned a faculty adviser who will be responsible for course registration for the junior and senior years. Unless students elect one of the special options given below, seven physics lecture courses and four physics laboratory courses at or above the 300 level are required during the junior and senior years. These are:

Physics 301, 302, 311, 312
Physics 331, 332 (Advanced Laboratory)
Physics 411, 412, 425
Physics 431, 432 or 433, 434 (Senior Research)

Students will select courses in mathematics or mathematical sciences in consultation with their advisers so that they will complete three semesters beyond the two-year introductory sequence.

In addition to the departmental requirements for the major, all students, including those who select one of the options below, must satisfy the distribution requirements and complete at least 60 semester hours outside the departmental requirements. Regular physics majors must complete a total program of at least 138 semester hours.

Physics majors with a special interest in applied physics, astrophysics, biophysics,or geophysics may wish to elect one of the special options described below.

Option in Space Physics and Astronomy. During the first two years, the requirements coincide with those for a standard physics major (described above). In addition, Space Physics and Astronomy 251, 252, and 262 should ordinarily be elected in the sophomore year. The following upper level courses are required:

Physics 301, 302, 311, 312
Physics 331, 332 (Advanced Laboratory)
Physics 425
Space Physics and Astronomy 471
Space Physics and Astronomy 431, 432 (Senior Research)
Upper level mathematics or mathematical sciences (two semesters)

Students selecting this option must complete a total program of at least 140 semester hours. A faculty adviser who is jointly appointed by the physics and the space physics and astronomy departments will be assigned to each student.

Option in Applied Physics. During the first two years, the student normally should satisfy the physics, chemistry, and mathematics requirements listed above for a standard physics major. The following additional courses are also required for graduation.

Engineering 241
Computer Science 211
Mathematical Sciences 330, 340 (or equivalent)
Physics 311, 312, 301, 302 (or Electrical Engineering 306)
Physics 411 or 412 or Electrical Engineering 461 or approved substitute
Physics 425
Physics Laboratories 331, 332, 431, 432

Electrical Engineering 326 or 342 may be substituted for Physics 331 or 332 with departmental approval.

Students selecting the applied physics option must complete a total program of at least 139 semester hours.

Option in Biophysics. During the first two years, the student should satisfy the physics, chemistry, and mathematics requirements listed above for a standard physics major. The following additional courses are also required for graduation:

Chemistry 211, 212, 213, 214 (should be taken second year)
Biology 201, 202, 203
Biochemistry 361, 362
Physics 301, 302, 311, 312

Students selecting the biophysics option must complete a total program of at least 136 semester hours.

Option in Geophysics. During the first two years, the student should satisfy the physics, chemistry, and mathematics requirements listed for a standard physics major. The following additional courses are also required for graduation:

Geology 101, 102
Computer Science 211
Physics 301, 302, 311, 312
Mathematical Sciences 340 (or equivalent)
Physics 431, 432, or 433, 434 (Senior Research)
Upper level mathematics or mathematical sciences (three semester hours)
Two upper level geology or geophysics courses to be selected with approval of the Physics Department (e.g., Geology 361, 442)

Students selecting the geophysics option must complete a total program of at least 140 semester hours.

Chemical Physics Major. An interdepartmental major in chemical physics is offered in conjunction with the Department of Chemistry. Students wishing to elect this major must obtain approval from both departments. In addition to the courses required of a standard physics major during the first two years, normally the student would take the following courses:

Chemistry 211, 212, 213, 214 (should be taken second year)
Chemistry 311, 312
Physics 311, 312 (or equivalents)
Physics 331, 332 or Chemistry 313, 314
Physics 301, 302
Upper level mathematics or mathematical sciences (six semester hours)

Students selecting a chemical physics major must complete a total program of at least 136 semester hours.

Graduate Program. The Department of Physics offers studies and research leading to the degrees of Master of Arts and Doctor of Philosophy. The Department of Physics offers research facilities and thesis supervision in the fields of astrophysics, atomic and molecular physics and quantum electronics, biophysics, nuclear and particle physics, condensed matter physics, and theoretical physics.

To be eligible for the Master of Arts degree, a graduate student must complete 30 semester hours of approved graduate level studies, including a research thesis performed under the direction of a physics faculty member. A minimum of one year of graduate study is required for the M.A.

To be eligible for the Doctor of Philosophy degree, a graduate student must first demonstrate to the department the ability to engage in advanced research. This is normally done by successfully completing the work for the Master of Arts in physics. The student

must also complete in residence 60 semester hours of approved graduate level study, including 21 semester hours in core courses and a research thesis completed under the direction of a physics faculty member. A minimum of two years of graduate study is required for the Ph.D. Further details of research programs in physics and departmental degree requirements are contained in a pamphlet *Graduate Study in Physics* available from the Department of Physics on request.

Physics

Physics Courses

101a. Mechanics (3-0-3).
The first semester of the calculus-based sequence in physics for science and engineering students.

102b. Electricity and Magnetism (3-0-3).
The second semester of the calculus-based sequence in physics for science and engineering students. See Physics 101 and 132.

121a. Technical Physics I (3-0-3).
A noncalculus survey of mechanics and thermodynamics, primarily intended for architecture and premedical students, with emphasis on problem solving. See Physics 123.

122b. Technical Physics II (3-0-3).
Continuation of Physics 121. Electricity, magnetism, sound, optics, and modern physics. See Physics 124.

123a. Introductory Physics Laboratory I (0-3-1).
Recommended for all students enrolled in Physics 121, 122 and 141.

124b. Introductory Physics Laboratory II (0-3-1).
See Physics 123.

132b. Elementary Physics Lab I (0-3-1).
Recommended for students enrolled in Physics 102.

141a. Concepts in Physics I (3-0-3).
Emphasis on the nature of physical phenomena, the conceptual development of physics, and related cultural influences. See Physics 123,124.

201a. Waves, Optics and Relativity (3-0-3).
The third semester of the four-semester sequence in physics for science and engineering students. See Physics 231.

202b. Modern Physics (3-0-3).
The final semester of the four-semester sequence in physics for science and engineering students.

231a. Elementary Physics Laboratory II (0-3-1).
Recommended for students enrolled in Physics 201.

301a. Intermediate Mechanics (4-0-4).
Classical mechanics and appropriate mathematical methods. Emphasis on problem solving.

302b. Intermediate Electrodynamics (4-0-4).
Classical electrodynamics and appropriate mathematical methods. Emphasis on problem solving.

311a. Introductory Quantum Physics I (3-0-3).
Fundamentals of quantum mechanics and applications to atomic and molecular structure.

312b. Introductory Quantum Physics II (3-0-3).
See Physics 311.

331a. Junior Physics Laboratory I (1-3-2).

332b. Junior Physics Laboratory II (1-3-2).

411a. Nuclear and Particle Physics I (3-0-3).
Foundation course in nuclear and elementary particle physics.

412b. Solid-State Physics II (3-0-3).
Foundation course in solid-state physics.

425a. Statistical and Thermal Physics I (3-0-3).

431a. Senior Physics Research I (0-6-2).

432b. Senior Physics Research II (0-6-2).

433a. Honors Research I (0-12-3).
The student pursues a research project in a similar way to Physics 431, 432 but in considerably greater depth. Prerequisite: permission of the department.

434b. Honors Research II (0-12-3).
See Physics 433.

461a,b. Independent Research (Variable).
A reading course in special topics.

515a. Advanced Classical Mechanics (3-0-3).
Langrangian and Hamiltonian dynamics, normal vibrations, rigid body motion, and the transformation theory of dynamics. Also offered as Space Physics and Astronomy 515.

521a. Quantum Mechanics I (3-0-3).
Graduate level quantum mechanics. Also offered as Space Physics and Astronomy 521.

522b. Quantum Mechanics II (3-0-3).
Continuation of Physics 521. Also offered as Space Physics and Astronomy 522.

526b. Statistical and Thermal Physics II (3-0-3).
A continuation of Physics 425 intended primarily for first-year graduate students and qualified undergraduates.

531a. Electromagnetic Theory I (3-0-3).
Graduate level electricity and magnetism. Also offered as Space Physics and Astronomy 531.

532b. Electromagnetic Theory II (3-0-3).
Graduate level electrodynamics. Also offered as Space Physics and Astronomy 532.

541a. Experimental Nuclear Physics (3-0-3).
Nuclear structure and reaction mechanisms. Study of accelerators, detectors, and systematics.

542b. Elementary Particle Physics (3-0-3).
Theory of elementary particles and characteristic features of experimental data.

551a. Stellar Interiors (3-0-3).
See Space Physics and Astronomy 551.

563a. Introduction to Solid State Physics I (3-0-3).
Fundamental concepts of crystalline solids, including crystal structure, band theory of electrons, and lattice vibration theory. Also offered as Electrical and Computer Engineering 563.

564b. Introduction to Solid State Physics II (3-0-3).
Continuation of Physics 563, including scattering of waves by crystals, transport theory, and magnetic phenomena. Also offered as Electrical and Computer Engineering 564.

595b,a. Physics Teaching (0-3-3).

621a. Advanced Quantum Mechanics I (3-0-3).
Relativistic quantum mechanics and quantum electrodyanamics.

622b. Advanced Quantum Mechanics II (3-0-3).
QED, QCD, and unified theories.

800a,b. Graduate Research (Variable).

Policy Studies

Degree Offered: B.A.

Undergraduate Program. Students are required to take 12 courses. Three introductory social science courses (each from a different discipline, but including Economics 211 or 212) selected from:

Anthropology 201, 306, Economics 211, 212, Political Science 210, 211, 212, Psychology 201, Sociology 203, 231, 353.

One course in statistical methods selected from:

Economics 350, Mathematical Sciences 280, 382, Political Science 495, Psychology 339, or a more advanced course.

One course in analytical approaches: social Science 300.

Three courses in advanced analysis selected from:

Anthropology 313, 314, 319, 333, 336, Economics 301, 370, 372, 375, 416, 440, 455, 483, History 350, Mathematical Sciences 301, Philosophy 307, Political Science 317, 318, 337, 339, 380, 435, Psychology 231, Sociology 301, 311, 325, 425.

Three courses in an applied area selected from one of the following groups:

1. Energy/Natural Resources/Regulation: Economics 436, 480, Political Science 336, Sociology 368, 396.
2. Human Resources/Health/Welfare: Anthropology 381, 383, 386, 388, Economics 415, History 370, 430, Philosophy 314, 315, Psychology 332, Religious Studies 462, 463, Sociology 313, Social Sciences 420.
3. Foreign Policy/International Relations: Anthropology 351, 353, 360, Economics 420, 430, 450, History 353, 455, 456, 469, Political Science 351, 353, 354, 360, 361, 371, 372, 375, 378, 379.
4. Law and Justice: Anthropology 326, Economics 438, History 297, 298, 397, 398, 432, Political Science 321, 325, 326, 410, Philosophy 316, Sociology 321.

5. Quantitative Analysis: Economics 400, 472, Mathematical Sciences 381, 480, 481, Mathematical Sciences/Economics 471, 475, 476, Psychology 340, Sociology 313, 496.
6. Urban Studies: Anthropology 348, Economics 461, History 367, Political Science 432, Sociology 308, 446, 496.

One approved special topics seminar or one semester of independent work in a participating department, involving a research paper on a policy topic.

In addition to the requirements for the major, students must also satisfy the University's distribution and graduation requirements. The policy studies major can be taken only as a second major. The first major cannot be also in an interdepartmental program. See Degree Requirements and Majors, pages 54-68.

Political Science

Associate Professor Richard J. Stoll, *Chair*
Professors J. Ambler, J. Cooper, G. Cuthbertson, R. Dix, and F. von der Mehden
Visiting Professors Huber, Krueger, Streng and Oppenheimer
Associate Professors J. Alford and R. Stein
Visiting Associate Professors M. Goggin and J. Sloan
Assistant Professors K. Bickers, C. Morgan and R. Wilson
Lecturers R. Eubank and C. Hudspeth

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Students majoring in political science are required to complete thirty semester hours (ten courses) in the field. All majors must also complete six semester hours (two courses) of advanced work, selected with the advice of the department, in any of the following fields: anthropology, behavioral sciences, economics, history, philosophy, psychology, or sociology.

Double majors in one of the above fields may automatically substitute six semester hours (two courses) in upper level courses in their second field for six of the required 30 semester hours in political science courses. Double majors whose second major is legal studies, managerial studies, or public policy may automatically substitute three hours (one course). Double majors whose second field is not listed above normally are required to take 30 semester hours (ten courses) in political science. They may petition for substitution of courses in other fields, but such substitutions are permitted only when the course to be substituted has a close and significant relationship to political science.

Within the major, each student is encouraged to take a program of courses that provides both a broad understanding of the field and a specialized knowledge of some portion of it. Specific distribution requirements are minimal. However, students are required to take at least one course in any four of the six areas listed below:

1. American politics
2. Comparative government
3. Law
4. International relations
5. Normative political theory
6. Empirical theory and methodology

Political Science 209, 210, 211, and 212 constitute the introductory courses in normative theory, American politics, international relations, and comparative government, respectively. Prospective majors are encouraged to take one or more of these courses, preferably in their first or second year. However, none is required of majors, except that Political Science 210 is the course that meets the Texas state licensing requirements in political science for teachers. It should be noted that no more than three of the above introductory courses may be counted toward the major, and that Political Science 310 may not be counted toward the major.

Two of the political science courses must be seminars (courses at the 400 or 500 level). A student may not take both seminars from the same faculty member. Reading courses will not satisfy this requirement. Students may not normally substitute a course in another department to meet this requirement. Students participating in the honors program (see below) are only required to take one seminar. Note that all courses at the 500 level require the student to obtain the permission of the instructor before registering, and that all seminars have an enrollment limit of 20.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Honors Program. Political science majors who qualify may enter an honors program. The program consists of (1) a one-semester reading course in the junior year (taken either term) which will serve as the basis for drawing up a prospectus for the senior essay, plus (2) the writing of the essay, normally in the senior year. The nine semester hours required for the major and are counted for purposes of distribution in the appropriate area within the major.

Admission to the honors program occurs, as a rule, in the spring of the sophomore year at the time majors are selected. Others may be admitted during the junior year. Double majors are eligible for the program. Admission requires the approval of the departmental director of undergraduate studies, Mr. Cuthbertson.

Interdisciplinary Programs. The Department of Political Science participates in the inderdepartmental programs in legal studies, managerial studies, and public policy. See description of these programs on pages 61 and 249 for legal studies, 61 and 255 for managerial studies, and 61 and 283 for public policy.

Graduate Program. The Department of Political Science offers a graduate program leading to the M.A. and the Ph.D. The Ph.D. student is expected to complete 48 semester hours in advanced courses or seminars prior to candidacy and to present a dissertation displaying original research. Normally, the student takes the core courses in the three general fields of American government, comparative government, and international relations. The student takes additional course work and comprehensive examinations in two of these three fields. Before taking the comprehensive examinations, the student is expected to complete a course in statistical analysis, demonstrate some familiarity with traditional political theory, satisfy the language or skill requirement in his or her major field, and complete all course requirements, including a two-semester sequence in scope and methods. Specific courses are chosen in consultation with the faculty adviser. A limited master's program also is offered by the department, consisting of three semesters of full-time study. The course work for the master's degree focuses primarily upon the student's major field. The third semester is devoted largely to the preparation of a thesis.

Political Science

Political Science Courses

209b. Introduction to Constitutionalism and Modern Political Thought (3-0-3).
Constitutionalism and authoritarianism from Machiavelli to Marx; introduction to contemporary ideologies. Together with Poli 210 meets state professional requirements for teachers.
Mr. Cuthbertson

210a. American Government and Politics (3-0-3).
Major topics in American politics: public opinion, group politics, political parties, elections, congressional-presidential-bureaucratic politics, and judicial politics. Together with Poli 209 meets state professional requirements for teachers.

Mr. Alford

211b. Introduction To International Relations (3-0-3).
An introduction to the study of international relations. The course examines topics from the role of individuals to the impact of the international system. Major issues, such as the causes of war and development of the third world are also discussed.

Mr. Stoll

212a. Introduction to Comparative Politics (3-0-3).
An examination of political institutions and behavior in selected democratic, communist, and "third world" countries.

Mr. Ambler

300b. Social Sciences/Public Policy (3-0-3).
Enrollment limited to 25.

Mr. Bickers and Mr. Rimlinger

305a. Directed Reading I (0-0-3).
Independent reading under the supervision of a member of the department. Open to junior majors in the honors program and to others in special cases with the permission of the instructor.

Mr. Cuthbertson

306b. Directed Reading II (3-0-3).
See Political Science 305.

Mr. Cuthbertson

309a. Law and Society (3-0-3).
An examination of the nature of law and of justice; employment of the casebook method to study specific aspects of the law. Enrollment limited to juniors and seniors.

Mr. Huber

310b. Law and Society (3-0-3).
See Political Science 309. Enrollment not limited.

Mr. Streng

317b. Congress (3-0-3).
Examines the role of Congress in the American political system. Attention is given to the historical development of Congress, the current status of the Congress, and the functions of Congress in the American political system. Enrollment limited to 75.

Mr. Oppenheimer

318a. The Presidency (3-0-3).
Presidential powers and behavior are analyzed in the context of the legal, electoral, personal, and other forces that shape and limit the actions of the president. Enrollment limited to 75.

Mr. Sloan

321a. American Constitutional Law (3-0-3).
Interpretation of the Constitution by the Supreme Court. (Juniors and Seniors preferred) Enrollment limited to 50.

Mr. Cuthbertson

336a. Politics of Regulation (3-0-3)
The course will focus principally on government regulation of business and the political factors that shape its content. Enrollment limited to 75.

Mr. Bickers

337b. Public Policy and Bureaucracy (3-0-3).
The role public bureaucracy plays in national policy-making process. Sources of agency power are examined and then linked to different policy outcomes. Offered irregularly.
Mr. Bickers

351b. Politics of Southeast Asia (3-0-3).
Political processes, institutions, and attitudes in selected Southeast Asian states. Emphasis on the postwar period, but traditional forces influencing contemporary political behavior also considered.
Mr. von der Mehden

354a. Latin American Politics (3-0-3).
A study of the political process in contemporary Latin America, with particular attention to selected major countries. Enrollment limited to 75.
Mr. Dix

360a. Western European Democracies (3-0-3).
A survey of government and politics in Western European democracies, with primary emphasis on Great Britain, France, and Germany. Enrollment limited to 75.
Mr. Ambler

361b. Comparative Communist Systems (3-0-3).
A survey of government and politics in selected communist systems, including the USSR and Communist China.
Mr. Ambler

372b. The Conduct and Control of American Foreign Policy (3-0-3).
Examines the internal and external aspects of foreign policy leadership, presidential initiative, congressional control, press, public opinion, and crisis management. Enrollment limited to 75.
Mr. Morgan

378a. Politics of American National Security (3-0-3).
Major issues of national security policy, including strategic doctrines, policy-making processes on defense issues, arms control, and conventional war. Enrollment limited to 75.
Mr. Stoll

379a. Problems in International Relations (3-0-3).
Not Offered.

405a. Senior Thesis (3-0-3).
Open to senior honors majors with the permission of the department. Students must complete both Political Science 405 and 406 to obtain credit. Prerequisite: permission of instructor.
Mr. Cuthbertson

406b. Senior Thesis (3-0-3).
See Political Science 405.
Mr. Cuthbertson

410a. Adjudication of Current Social Issues (3-0-3).
Most political and social questions in America, as Tocqueville observed, ultimately become judicial questions. In this course we examine current developments in several fields, including basic constitutional issues, property, contracts, torts, crimes, corporate responsibility and privacy. Enrollment limited to 10 students. Prerequisite: Permission of the instructor.
Mr. Hudspeth

430a. Seminar in Texas Politics (3-0-3).
Research seminar in the history of Texas politics. Enrollment limited to 20. Prerequisite: permission of instructor.
Mr. Cuthbertson

431a. Electoral Campaigns (3-0-3).
Examines the role of campaigns in determining the outcome of political races. Enrollment limited to 20. Prerequisite: permission of instructor.

Mr. Alford

432a. Urban Politics (3-0-3).
Examines issues of political behavior and public policy in urban and metropolitan areas. Specific topics include urban decline and revitalilzation, conflict between "Snowbelt" and "Sunbelt" cities, fiscal management, and urban and suburban relations. Enrollment limited to 20. Prerequisite: permission of instructor.

Mr. Goggin

435a. Introduction to Political Analysis (3-0-3).
This course is intended as an introduction to quantitative political analysis for incoming graduate students and senior undergraduates considering graduate study in political science. Enrollment limited to 20. Not offered 1987-88.

Mr. Alford

457a. Conditions of Democracy (3-0-3).
An examination of why some countries are democratic and others not, with particular emphasis on the breakdown and restoration of democracy in Latin America and Southern Europe. Enrollment limited to 20.

Mr. Dix

460a. Seminar in Comparative Government (3-0-3).
The maintenance of power in authoritarian regimes. Enrollment limited to 20. Prerequisite: permission of insructor.

Mr. von der Mehden

462b. Comparative Public Policy (3-0-3).
This seminar will examine the process and substance of public policy across nations, with a primary focus upon Western democracies. Attention will be given to such policy areas as education, health, economic policy, and defense. Enrollment limited to 20. Prerequisite: permission of instructor.

Mr. Ambler

465b. Inter-American Relations (3-0-3).
This seminar will examine relations between the United States and the countries of Latin America, with particular emphasis on the efforts of the U.S. to promote or inhibit political change, including revolutionary change in Latin America. Enrollment limited to 20.
Prerequisite: permission of instructor.

Mr. Dix

470b. Research Seminar in International Relations (3-0-3).
Conflict modeling and quantitative analysis of alliance formation, foreign aid, regime structures, ideologies, and arms races as they affect the probability of war. Enrollment limited to 20.
Prerequisite: permission of instructor.

Mr. Morgan

471a. Seminar on Current U.S. Foreign Policy (3-0-3).
The seminar will address issues in the formulation, administration, and conduct of U.S. foreign policy. Prerequisite: permission of instructor. Enrollment limited to 15 students.

Mr. Krueger

472a. American Foreign Policy (3-0-3).
The content of American foreign policy, its sources, and the process of policy formulation. Enrollment limited to 20. Prerequisite: Permission of the instructor.

Mr. Morgan

473b. Seminar on Current U.S. Domestic Policy (3-0-3).
The seminar will address issues in U.S. domestic politics and policy, such as political action committees; U.S. trade policy and pending legislation; farm policy and the Congress. Enrollment limited to 15. Prerequisite: permission of the instructor.

Mr. Krueger

474a. Collective Social Choice (3-0-3).
The objective of this course is to introduce students to a growing body of literature on how and why individual preferences dominate those of others; and the relationship between decision making structures and the nature of decisional outcomes. Enrollment limited to 20. Prerequisite: permissiion of instructor.

Mr. Wilson

490b. Modern Political Theory and Interdisciplinary Fields (3-0-3).
The development of political fiction, the political novel as political theory, and the relevance of the political novel to contemporary problems. Enrollment limited to 20.

Mr. Cuthbertson

495a. Introduction to Statistics (3-0-3).
This course aims at providing students with a working knowledge of statistics in political science. It involves the study of descriptive and inferential statistics, as well as hands-on experience with computer statistical packages. Enrollment limited to 20. Prerequisite: permission of instructor

Mr. Wilson

511b. Measurement and Research Design (3-0-3).
Research design. Measurement theory. Data collection and modes of analysis. Use of the computer in political research. Theory building. Prerequisite: permission of instructor.

Mr. Alford

520a. Approaches to Comparative Governmentt (3-0-3).
Core graduate course analyzing basic approaches to the study of comparative government. Open to qualified undergraduates with permission of instructor.

Mr. von der Mehden

527b. Organization Theory (3-0-3).
Examination of applications of organization theory to the study of American political institutions.

Mr. Cooper, Mr. Wilson

530b. Approaches to American Government (3-0-3).
Core graduate course analyzing basic approaches to the study of American politics. Prerequisite: permission of instructor.

Mr. Alford

537a. Public Administration (3-0-3).
The administration and implementation of public policies across federal, state, and substate governments. Prerequisite: permission of instructor. Also offered as Administration 563. Not offered 1987-88.

Mr. Stein

540b. International Relations (3-0-3).
Core graduate course analyzing basic approaches to the study of international relations. Open to qualified undergraduates with permission of instructor. Not offered 1987-88.

564a. Public Financial Management (3-0-3).
Also offered as Administration 564.

Mr. Windsor

566b. Topics in Management II (3-0-3).
Also offered as Administration 594. Section I: Public-Private Partnerships.

Mr. Brosch and Mr. Loukissas

571b. Political Risk Analysis (3-0-3).
Analyses of political and social factors affecting business operations abroad, including domestic instability, foreign conflict, corruption, nationalization, indigenization, etc. A simulation exercise is required. Prerequisite: permission of instructor. Also offered as Administration 571.

Mr. von der Mehden

580a. American Politics (3-0-3).
Reading and original research on selected topics in American Politics. Enrollment limited. Prerequisite: Permission of instructor.

Mr. Bickers

581b. Congress—Organization (3-0-3).
Examines the linkages between the United States Congress, its environment, and its policy outputs. Prerequisite: permission of instructor. Not offered.

591a. Directed Reading—Methodology (3-0-3).

Mr. Wilson

592b. Methodology and Research Design (3-0-3).

593a. Directed Reading—American Politics (3-0-3).

594b. Directed Reading—American Politics (3-0-3).

595a. Directed Reading in International Relations(3-0-3).

Mr. Stoll

596b. Directed Readings—International Relations(3-0-3).

597a. Directed Readings—Comparative Politics(3-0-3).

Mr. von der Mehden

598b. Directed Readings—Comparative Politics(3-0-3).

600a,b. Topics in Political Science (Variable).
Research and thesis for resident students.

800b,a. Ph.D. Research and Thesis (Variable).

Psychology

Professor Laughery, *Chair*
Professors Brelsford, Dipboye, Howell, R.N. Taylor, Tuggle, and Watkins
Adjunct Professors Overall, Wright
Associate Professors C.A. Anderson, Burnett, D.M. Lane, R. C. Martin
Assistant Professors Cooke, Gaugler, and W.R. Wilson
Adjunct Assistant Professors Burnside, Loveland, and Wunder
Adjunct Instructor: Diddel

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Twenty-nine semester hours are required for a major in psychology. The following courses are required for the major in psychology: Psychology 101, 202, 203, 339, and 340. There may be no substitution or transfer credit for 339 or 340. In addition to the five required courses listed above, the student must take at least one course from each of the following blocks of courses:

Block 1: Psychology 308, 309, 351, 362
Block 2: Psychology 330, 332, 372

An honors program is available that requires completion of the major requirements listed above, an honors thesis, and other requirements as determined by the student's honors committee. Candidates for the honors program must submit an application. A decision to admit a student will be made by vote of the faculty.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Graduate Program. Graduate programs are offered at both the M.A. and Ph.D. levels. The emphasis, however, is upon doctoral training, and only applicants of Ph.D. caliber are admitted.

A research thesis with public oral defense is required for both M.A. and Ph.D. degrees. In addition, 60 semester hours must be accumulated for the Ph.D. and 30 for the M.A. Included in this total are required courses in the areas of memory, cognition, engineering and industrial/organizational psychology, social psychology, and methodology, plus whatever offerings are available in the student's specialty area. The three specialty areas currently offered are cognitive-experimental, industrial-organizational/social, and engineering psychology.

Competence in a foreign language is not required. The student must, however, pass an admission-to-candidacy procedure designed to establish his or her expertise in the chosen specialty area.

Psychology Courses

101a,b. Introduction to Psychology (3-0-3).
Overview of current research and theory in a variety of subareas of psychology.
Mr. Brelsford, Mr. Howell

202a. Introduction Social Psychology (3-0-3).
An introduction to the major theories and supporting research in social psychology. Prerequisite: Psychology 101.
Mr. Dipboye

203b. Introduction to Cognitive Psychology (3-0-3).
An introduction to topics in cognitive psychology including perception, memory, psycholinguistics, problem solving and decision making. Prerequisite: Psychology 101.
Ms. Cooke

221a. Developmental Psychology (3-0-3).
Focus on behavioral changes with age and general laws of development in both human and nonhuman species. Prerequisite: Psychology 101.
Mr. Lane

231b. Industrial and Organizational Psychology(3-0-3).
An overview of the principles, techniques, and theories of psychology applied in the industrial setting. Prerequisite: Psychology 101, Mathematical Sciences 280.
Ms. Gaugler, Mr. Dipboye

308a. Memory (3-0-3).
Critical review of traditional and contemporary approaches to the study of remembering and forgetting. Prerequisite: Psychology 101, 203 or permission of instructor. Limit 50.
Ms. Cooke

309a. Psychology of Language (3-0-3).
Human and other animal communication, structure of human language, word meaning and semantic memory, psychological studies of syntax, bilingualism, language and thought, language errors and disorders. Prerequisite: Psychology 101, 203 or permission of instructor. Limit 50. Offered alternate years. Also offered as Linguistics 309.

Ms. Martin

330b. Personality Theory (3-0-3).
Consideration of those aspects of personality emphasized by the major theorists past and present. Prerequisite: Psychology 101, 202. Limit 50. Offered alternate years.

Mr. Anderson

332b. Abnormal Behavior (3-0-3).
Reactions to stress, neurotic traits, therapy, depression, and schizophrenia. The course presents an eclectic, empirically-based exploration of the subject of abnormal psychology and explores topics and theories in the light of research findings. Prerequisite: Psychology 101, 202 or permission of instructor. Limit 50.

Ms. Burnett

339a. Statistical Methods—Psychology (3-1-4).
Introduction to quantitative and computer methods applicable to the analysis of experimental data. Prerequisite: 101 or permission of instructor. Limit 50.

Mr. Brelsford

340b. Research Methods (3-1-4).
A continuation of Psychology 339 with a strong emphasis on individual student experiments and the writing of research reports. Prerequisite: Psychology 101, 339. Limit 50.

Mr. Watkins

351a. The Psychology of Perception (3-0-3).
An overview of the sensory and cognitive processes involved in human vision and audition. Prerequisites: Psychology 101, 203 or permission of instructor. Offered alternate years. Not offered 1987-88.

362b. Physiological Psychology (3-0-3).
An overview of the neurophysiological correlates of behavior. Prerequisite: Psychology 101.

Staff

429a. Tests and Measurement (3-0-3).
Techniques for measuring individual differences and critical review of theories of individual differences in intelligence and personality. Limit 50. Prerequisite: Psychology 101, 339 and permission of instructor.

Ms. Gaugler

431b,a. Advanced Topics—Social Psychology (3-0-3).
Prerequisite: permission of instructor.

Mr. Anderson

433a,b. Advanced Topics in Cognitive Psychology(3-0-3).
Prerequisite: permission of instructor.

Ms. Cooke

435a,b. Advanced Topics in I/O Psychology (3-0-3).
Prerequisite: permission of instructor.

Ms. Gaugler

437b. Advanced Topics—General Psychology (3-0-3).
Prerequisite: permission of instructor.

Mr. Brelsford

439a,b. Advanced Topics in Psychopathology (3-0-3).
Prerequisite: permission of instructor.

Ms. Burnett

442b. Computer Applications (3-0-3).
Use of small computers in psychological research. Prerequisite: permission of the instructor. Limit 10.

Mr. Lane

450a. Animal Behavior Methods (3-0-3).
Lecture, discussion, and laboratory course in learning and behavioral control. Theoretical issues and applications in classical conditioning, instrumental, stimulus control, and aversive control. Prerequisite: permission of instructor. Limit 5.

Mr. Wright

470b. Engineering Psychology (3-0-3).
Principles of psychology and human performance applied to the design of modern systems. Prerequisite: Psychology 101, 203 or permission of instructor. Limit 50.

Mr. Laughery

491a,b. Independent Study and Research (3-0-3).
Prerequisite: Permission of instructor.

Mr. Howell, Mr. Brelsford

499b,a. Senior Thesis (Variable).
Prerequisite: Psychology 101, 339, 340 and permission of instructor.

Mr. Watkins, Ms. Burnett

509a. Advanced Psychological Statistics (3-0-3).
Descriptive and inferential statistics for beginning graduate students in psychology. Prerequisite: permission of instructor.

Mr. Lane

510b. Advanced Psychological Statistics (3-0-3).
Descriptive and inferential statistics for beginning graduate students in psychology. Prerequisite: permission of instructor.

Ms. Martin

512a. Advanced Social Psychology: Group Processes(2-0-2).

Mr. Howell

513a. Advanced Social Psychology: Cognitive Processes(2-0-2).

Mr. Dipboye

515a. Topics in Cognitive Psychology (3-0-3).

Ms. Martin

516b. Topics in Cognitive Psychology (3-0-3).

Mr. Watkins

517b. Topics in Social Psychology (3-0-3).

Mr. Anderson

518a. Foundations of I/O Psychology (2-0-2).

Ms. Gaugler

519a. Foundations—Engineering Psychology (2-0-2).

Mr. Laughery

520a,b. Engineering Psychology (3-0-3).

Mr. Laughery, Mr. Brelsford

521a. Advanced Learning and Memory (2-0-2).

Ms. Burnett

522a. Advanced Cognition (2-0-2).
Ms. Cooke

531b. Survey of I/O Psychology (3-0-3).
Mr. Dipboye

532b. Readings in I/O Psychology (3-0-3).
Mr. Dipboye

533b. Personnel Psychology (3-0-3).
Ms. Gaugler

543a,b. Advanced Research Seminar (1-0-1).
Mr. Watkins

544a. Organizational Psychology (3-0-3).
Mr. Howell

547b. Psychology Presentations (2-0-2).
A practicum in oral and written psychology presentations.
Mr. Watkins

551a,b. Non-Thesis Graduate Research (Variable).
Mr. Watkins

553a,b. Graduate Teaching in Psychology (3-0-3).
Mr. Watkins

554a. First-Year Graduate Paper (3-0-3).
Ms. Burnett

555a,b. Second-Year Graduate Research (Variable).
Mr. Laughery, Mr. Watkins

561a,b. Industrial-Organizational Internship(Variable).
Mr. Dipboye, Ms. Gaugler

563a,b. Engineering Psychology Internship (Variable).
Mr. Laughery

800a,b. Thesis Research (Variable).
Mr. Howell

Religious Studies

Professor Nielsen, *Chair*
Professors Kelber, Rupp, and Sellers
Adjunct Professor Reiser
Adjunct Assistant Professor Sanborn
Lecturers Benjamin, Dunne, T.F. Freeman, and Karff
Adjunct Lecturer Heitman
Visiting Professors Hillerbrand and Küng

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. All undergraduates majoring in religious studies are expected to enroll in one of the introductory courses offered at the first-or second-year level. A total of 24 semester hours (eight courses) in advanced courses are required for completion of the major. At least six semester hours (two courses) are to be elected in each of the following areas represented in the Department:

1. Historic and Biblical studies
2. Interpretation, theology, comparative religions
3. Religion in the modern world

Qualified upperclass students are given an opportunity to engage in independent work. Related courses offered by other departments may be taken for credit in religious studies with the approval of the major adviser.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Graduate Program. The Department of Religious Studies offers graduate work in a variety of fields: Judeo-Christian origins, church history, philosophy of religion (including theology), and ethics. In keeping with the traditions of Rice University, study and research are not confessionally oriented. The awarding of advanced degrees is not based solely on the accumulation of credits or compliance with formal requirements. Course plans are determined according to the preparation, needs, and interests of the candidate. A capacity for independent work is considered essential to study in the department.

Cooperative Graduate Study in Medical Ethics. Under an agreement with the University of Texas Health Science Center at Houston, a cooperative program of graduate study in medical ethics is offered, leading to the M.A. and Ph.D. degrees from Rice University.

Clinical experience and case studies are provided through the Health Science Center's Program in Humanities and Technology in Medicine. Central to the cooperative plan is the interdisciplinary seminar in medical ethics (two semesters), with students and instructors from both institutions. Thus students from the Department of Religious Studies have the opportunity to work with students from such disciplines as medicine, nursing, and public health.

Library resources of the Health Science Center are open to Rice graduate students in medical ethics.

Fellowship in Religious Studies for Study Abroad. A fellowship has been established to encourage advanced students to spend a year in another university, in most cases after they have completed their comprehensive qualifying examinations for the Ph.D. degree. It is available equally to persons in any field of study offered in the department. The recipient is chosen by faculty members responsible for graduate work. The cost of air travel is

paid in addition to a monthly stipend. Additional costs, such as tuition for study at particular institutes, are considered on a case-to-case basis. Award is made annually, subject to availability of funds.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department; normally, this includes 24 semester hours in advanced courses plus thesis work.
2. Satisfactory performance on a reading examination in French or German.
3. Satisfactory performance on preliminary written and oral examinations in the field of religious studies; normally, these include biblical studies, church history, philosophy of religion (including theology), and ethics, with detailed attention to the area of thesis specialization.
4. Completion of an acceptable thesis.
5. Satisfactory performance on a final oral examination.

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the department; normally, this includes 54 semester hours of course work, counting those given for the degree of Master of Arts. Six of these semester hours may be waived upon petition to the graduate faculty after the first year. Normal minimum residence is at least two years, even for candidates already holding advanced degrees.
2. Satisfactory performance on a reading examination in both French and German.
3. Satisfactory performance on preliminary written and oral examinations in religious studies. Candidates for the doctoral degree are expected to prepare themselves for six qualifying examinations, four of which are to cover the basic areas of biblical studies, church history, philosophy of religion (including theology), and ethics; the other two are to be taken in the major area of concentration.
4. Completion of a formal proposal and dissertation, both to be approved by the department.
5. Satisfactory performance of a final oral examination on the dissertation and related fields.

Religious Studies Courses

111a. Religion and Culture (3-0-3).
Examination of major traditions of the East and West. Religion in human experience: personal, historical, cultural, and theological dimensions.
Mr. Nielsen

112b. Religion and Culture (3-0-3).
Religious alternatives. The secular versus the sacred. Competing world views, East and West. Enrollment limited.
Ms. Dunne

202b. Atheism (3-0-3).
Readings in Marx, Feuerbach, Nietzsche, Sartre, Bloch, as well as classical theistic arguments.
Mr. Nielsen

203a. Radical Revolutionaries of Thought (3-0-3).
Study of the founders of the great religions as well as contemporary thinkers.
Mr. Coleman

204b. Deity, Mysticism, and the Occult (3-0-3).
Critical, phenomenological study of the psychology of religion and the occult. Comparative use of the categories of the Western and Eastern traditions.

205a. Archaeology and the Bible (3-0-3).
The Bible-on-location with slides from excavations in Jordan, Israel, Sinai & Cyprus. The Bible story alongside stories which architecture, pottery, metalwork, sculpture, tombs, painting & other arts in Biblical lands tell.

Mr. Benjamin

301a. Mysticism and Existentialism (3-0-3).
Examination of these two approaches to life in Christian and non-Christian literature, ancient and modern.

Ms. Dunne

302b. Jewish-Christian Dialogue (3-0-3).
Discussion of the basic questions which appear in interfaith exchange. Jewish and Christian beliefs about God, man, history, evil and eschatology.

Mr. Karff, Mr. Nielsen

303a. Monotheistic Religions: (3-0-3).
Lectures on the major monotheistic religions. Discussion of early, medieval, modern and post-modern paradigms in Judaism, Christianity, and Islam, and the tensions between them.

Mr. Küng

307a. Jesus in History (3-0-3).
The life of Jesus viewed against the background of the political, social, cultural, economic, and religious history of his time.

Mr. Kelber

310b. Pauline Theology (3-0-3).
Introduction to the theological controversies between Paul and anti-Pauline Christians.

Mr. Kelber

311a. History of Religion (3-0-3).
Readings in the religious texts of India, China, and Japan. Study of Hinduism, Buddhism, Confusianism, and Taoism.

Mr. Preece

312b. History of Religion (3-0-3).
Study of Judaism, Christianity, and Islam in their historical development. Attention to the basic themes of Western theism. Enrollment limited.

Ms. Dunne

314b. Introduction to Islam (3-0-3).
Study of the history and traditions of the religion founded by Mohammed, Koran, Sufi mysticism and the influence of Islam in the West.

Mr. Nielsen

321a. Seminar on a Contemporary Theologian: C.S. Lewis(3-0-3).
Study and critical evaluation of the writings of a contemporary religious thinker. Lewis' outlook compared with that of Thomas Merton and Dietrich Bonhoeffer.

Mr. Highfield

331a. Psychology of Religion (3-0-3).
Study of the primary developments in the field, with particular emphasis on changing issues and methods. Enrollment limited.

Mr. Dunne

334b. Psychology of Religion (3-0-3).
Significant contemporary problems examined from a clinical standpoint, e.g.,ideas of God, evil, anxiety, guilt, and therapeutic process.

Mr. Sanborn

341a. Human Rights and Dignity I (3-0-3).
An exploration of questions raised by contemporary phenomena such as terrorism, torture, and totalitarianism.
Mr. Khushf

345a. Ethics and Life Cycle I (3-0-3).
Concrete problems of the life "spiral," including the quest for identity, sex ethics, medical ethics, aging, death and dying.
Ms. Heitman

347a. Varieties of Contemporary Religion (3-0-3).
Varying religious life styles, traditional and nontraditional, in the Indian, Black, Mexican-American, Islamic, and Jewish communities. Consideration of worship, sacred literature, ethics, community involvement, evangelical efforts. Field trips, guests, discussion.
Mr. Freeman

348b. Community Ethical Dilemmas (3-0-3).
Current community problems and their ethical and religious implications: drugs, race, inequities, poverty, law enforcement, religious intolerance. Guest speakers, visitations.
Mr. Freeman

357a. Women in the Bible (3-0-3).
Teaching literature in Ancient Israel. Clan-mothers and queens, warriors, wives, and lovers in Proverbs, Qoheleth, Job, Psalms, Song of Songs, Ruth, Judith, Esther.
Mr. Benjamin

358b. Bible, Creation, and Apocalypse (3-0-3).
Alpha and Omega stories in Ancient Israel: The Garden of Eden, the Flood, the Exodus, the Battle of Jericho, Isaiah's Messiah, Ezekiel's New Jerusalem, Daniel, Zechariah, Jonah.
Mr. Benjamin

375a. Man in the Cosmos (3-0-3).
Fundamental questions on the nature of humanity and its place in the universe.

376b. Origin of the Universe (3-0-3).
Major cosmological theories and their effect on both religious and secular thinking.
Mr. Jones

401a. Independent Study (3-0-3).
Mr. Nielsen

402b. Independent Study (3-0-3).
Mr. Nielsen

415b. Contemporary Moral Problems (3-0-3).
Discussion of controversial moral issues such as abortion, euthanasia, capital punishment, war, and the role of the state.
Ms. Heitman

454a. History of Christianity II (3-0-3).
Survey from the Reformation to the seventeenth centur
Mr. Hillerbrand

462a. Medical Ethics and American Values I (3-0-3).
Readings and discussion of the principles and priorities of medical ethics, with attention to historical development. Prerequisite: permission of instructor.
Ms. Heitman, Mr. Reiser

463b. Medical Ethics and American Values II (3-0-3).
Continuation of 462, with attention to clinical experience. Prerequisite: Religion 462.
Mr. Reiser, Ms. Heitman

501a. Reformation: Zwingli—Anabaptists (3-0-3).

502b. Reformation: English (3-0-3).

507a. Pauline Theology (3-0-3).

Mr. Kelber

509b. New Testament and Hermeneutics (3-0-3).

Mr. Kelber

511a. Seminar in Hebrew Religion I (3-0-3).

Mr. Benjamin

512b. Hebrew Religion II (3-0-3).

Mr. Benjamin

521b. Non-Christian Religious Philosophies (3-0-3).
Critical examination of major traditions of Indian and Chinese philosophy, historical development and modern expressions of Hindu and Buddhist thought.

Mr. Nielsen

523a. Independent Study (Variable).

Mr. Nielsen

524b. Independent Study (Variable).

Mr. Nielsen

525a. Theoretical Principles of Interreligious Dialogue (3-0-3).

Mr. Kung

526a. Seminar—Contemporary Theology (3-0-3).

Mr. Nielsen

528b. Ecumenical Theology Seminar (3-0-3).

Mr. Nielsen

541a. Seminar in Ethics (3-0-3).

Mr. Sellers

542b. Seminar in Ethics and Society (3-0-3).

Mr. Sellers

543a. Seminar in Medical Ethics and American Values(3-0-3).

Ms. Heitman, Mr. Reiser

544b. Medical Ethics and American Values II (3-0-3).
Prerequisite: Religion 543.

Mr. Reiser, Ms. Heitman

545a. Advanced Tutorial in Medical Ethics (3-0-3).
Tutorial studies for graduate students in health care ethics who have completed the required first year semester.

Mr. Sellers

553a. Departmental Colloquium (3-0-3).

Mr. Nielsen

554b. Departmental Colloquium (3-0-3).

Mr. Nielsen

800b,a. Thesis Research (Variable).

Mr. Nielsen

Sociology

Professor Davidson, *Chair*
Professors C. Gordon, Klineberg, and W. C. Martin
Associate Professor Long
Assistant Professor K. Tucker
Adjunct Professor D. P. Smith

Degree Offered: B.A.

Undergraduate Program. The major is designed to enable students to gain greater understanding of the nature of human societies as an important part of a liberal education, as a foundation for a variety of occupations, and as preparation for graduate study. The program provides students with considerable latitude in pursuing substantive interests, while ensuring a basic familiarity with theoretical approaches and issues of methodology. Majors in sociology are not required to take a foreign language; those planning graduate study, however, should be aware that many graduate departments of sociology require demonstrated competence in at least one foreign language. A minimum of 27 semester hours (nine courses) in sociology must be passed, of which at least 21 semester hours (seven courses) must be at the advanced level. In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete at least 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Requirements for the major in sociology are: (1) Sociology 203; (2) at least one of the two courses emphasizing theoretical approaches, Sociology 317 or 353; (3) Sociology 421; and (4) at least 18 semester hours (six courses) in the substantive areas of sociological specialization. A statistics course such as Mathematical Sciences 280, 301, 381, 480, or 481 or an independent study course (Sociology 403, 404, 493, 494) may be used as one of these.

All sociology courses listed are regularly offered by the present faculty, although not necessarily every year. Additional courses may be offered with the addition of new faculty or variations in present course assignments; similarly, some courses may be discontinued from the regular offerings. It is the responsibility of the student to consult the listing of University distribution requirements before registering in order to satisfy all the requirements for his or her degree. The registration of every sociology major must be signed by the departmental adviser, Professor Long.

Honors Program. The honors program is designed to (1) provide undergraduates whose primary concentration is in the field of sociology with the opportunity to deepen their understanding of the sociological perspective through a two-semester program of directed independent research and writing, and (2) provide an opportunity for the recognition of undergraduates who have demonstrated unusual competence in sociology and capacity for sustained independent research.

To be eligible for the program, a student must have maintained a "B" average in at least four sociology courses beyond the introductory level. During the first semester of the junior year, students who meet this requirement are invited to submit, no later than two weeks prior to registration for the spring semester, a description of their proposed research project to the Undergraduate Honors Committee (Professor Elizabeth Long, chair). This committee, in consultation with the candidate, evaluates the proposal in terms of both its feasibility and its sociological significance. Upon acceptance into the program, the student

is assigned a faculty adviser to supervise the student's independent research and the selection of further courses relevant to the project. It is expected that all honors candidates will have completed Sociology 421 before beginning their second semester of honors research.

Honor students register for two successive semesters of directed honors research (Sociology 493, 494). The first semester is normally devoted to a review of the relevant literature and the preparation of a detailed outline of the planned research. The research itself is normally carried out during the second semester and written up as a completed honors thesis by the end of that period.

The thesis is read and evaluated by two other faculty members in addition to the student's primary adviser and followed by an oral examination open to the public. These three faculty members share responsibility for determining departmental honors based on the student's performance in the program as a whole.

Sociology

Sociology Courses

203. Introduction to Sociology (3-0-3).
Introduction to the principal concepts, theories, and methods of sociology.
Mr. Tucker

231. Race and Nationality (3-0-3).
The role of race and nationality in society, ethnic cultures, prejudice, political institutions, patterns of conflict and cooperation; discrimination and its remedies.
Mr. Davidson

301. Social Inequality (3-0-3).
A study of the extent of social inequality, its causes, costs, and benefits. Can (and should) it be abolished? Is inequality compatible with democracy?
Mr. Davidson

306. Sociology of Gender (3-0-3).
Relationship between gender and social role. Development of the contemporary sexual division of labor and process of socialization with reference to family, education, media, and occupations.
Ms. Long

308. Houston: Sociology of a City (3-0-3).
An approach to urban sociology, using metropolitan Houston as a case study. Neighborhoods, politics, transportation, land use, ethnic groups, housing, cultural institutions. Field trips required.
Mr. Davidson

311. Collective Behavior (3-0-3).
Consideration of relatively noninstitutionalized conduct: crowds, mobs, publics, social movements; conditions and consequences of social unrest, excitement, panic, protest, and terrorism.
Mr. Gordon

313. Demography (3-0-3).
An introduction to the study of dynamics of population change. Demographic data sources, components of population change, mortality patterns, family planning, the measurement of migrations, population-economic models.
Mr. Smith

317. Basic Trends in Sociological Theory (3-0-3).
Four basic paradigms: social factism (functional theory and conflict theory); social behaviorism (psychological behaviorism and social exchange); social definitionism (action theory and symbolic interactionism); and social constructionism (phenomenological and ethnomethodological theorizing).
Mr. Tucker

319. The Sociology of Work Occupations (3-0-3).
The influence that occupation has upon lifestyle, values, social and economic status, and views of the world. Field work by the student will be encouraged.
Mr. Davidson

321. Criminology (3-0-3).
Types of criminal behavior, theories of crime and juvenile delinquency, with attention to the role of police, courts, correction agencies, and other social structures.
Mr. Martin

325. Bureaucracy (3-0-3).
The bureaucratic "revolution" and its implications in relation to work, social structure, quality of life, the possibility of democracy.
Ms. Long

331. Politics and Society in Texas (3-0-3).
Texas as an emerging industrialized state with deep roots in a Southern rural past. Populism; "folk conservatism"; cosmopolites and yahoos; theories of how Texas politics works.
Mr. Davidson

334. Family Structures and Processes (3-0-3).
Comparative analysis of role structure, sexuality, emotional bonds, and interaction patterns in differing forms of contemporary families. The functioning of the family in differing cultures, classes, and lifestyles.
Ms. Long

336. Mass Communications (3-0-3).
Structure, social context, and efforts of large-scale impersonal communication to dispersed and heterogeneous audiences, through such media as televison, radio, print, motion pictures, and recordings.
Mr. Tucker

340. Marx and Freud: Humanism and Terror (3-0-3).
Exploration of two revolutionary modern thinkers, focusing on the tension between freedom and determinism in their thought and the theory and practice of their heirs.
Mr. Davidson

353. Conceptions of Human Nature (3-0-3).
The perspectives of sociobiology, psychoanalysis, behaviorism, and symbolic interactionism; the "paradigm shift" toward viewing human beings as actively engaged in the construction of reality.
Mr. Klineberg

354. Personality and Social Systems (3-0-3).
An attempted integration of the perspectives of psychology and sociology in relation to the determinants of individual behavior and to the processes of social change.
Mr. Klineberg

360. Television in American Culture (3-0-3).
Analysis of telvision as popular art, in the context of politics, industry, and other cultural forms.
Mr. Gordon

375. Power Structure Analysis (3-0-3).
Theories of how power is distributed in America. Controversies about methods for determining "who really rules." Elites, social classes, interest groups. Informal cliques. Interlocking directorates. The role of private clubs and exclusive schools in elite recruitment. Research will be conducted by students, using a city or state as a laboratory.
Mr. Davidson

386. Sexuality and the Social Order (3-0-3).
Ways societies conceive of and regulate sexuality in members' lives; sexual value systems; forms of sexual conduct (especially number and identities of participants and intimacy and power relations among them); the changing role of sexuality over the typical life span; forms and effects of sexual communication, and issues in the future of sexuality.
Mr. Gordon

390. Sociology of Leisure (3-0-3).
Leisure activity (relaxation, diversion, personal development, creativity, and sensual transcendence) in relation to work, family, education, income, socioeconomic status, and life-cycle stage.
Mr. Gordon

403. Independent Study (3-0-3).
Directed reading and written papers on subjects not regularly offered; advanced study of subjects on which courses are offered. Prerequisite: permission of the department.
Staff

404. Independent Study (3-0-3).
Directed reading and written papers on subjects not regularly offered; advanced study of subjects on which courses are offered. Prerequisite: permission of the department.
Staff

421. The Craft of Sociology (3-0-3).
What has been, and is today, the "work" of sociology? This question will be addressed by a self-reflective exploration of the discipline—its historical and social origins and development, its shifting philosophical foundations, its methodological refinements, its ethical and political implications—and discussion of sociological studies, both classic and controversial.
Ms. Long

425. Political Sociology (3-0-3).
Examination of social phenomena that impinge on political systems; mass society, informal power structures, ideology, intergroup conflict, insurgent social movements.
Mr. Davidson

430. Sociology of Religion (3-0-3).
Religious beliefs, symbols, actions, organizations, roles, and various interrelationships between religion and society, including new religious movements, secularization, and functional alternatives to religion. Field work.
Mr. Martin

432. Sociology of the Life Cycle II: Adulthood and Aging (3-0-3).
Seminar analyzing identity transformations, adult socialization, occupation, family, role losses, and death from young adulthood through old age. Effects of sex role, social class, and ethnicity.
Mr. Gordon

433. Sociology of the Life Cycle: Death and Dying (3-0-3).
Consideration of the social meanings of death in various cultures; medical and other definitions of death; attitudes toward death and dying; career of the self in life and death; too-early, on-time and too-late deaths; "near-death experiences"; social management of death and dying in various organizational settings (homes, hospitals, nursing homes, hospices, battle fields, etc.); changing causes of death, mortality rates and demographic characteristics of dying persons; various types of death (suicide, accident, illness, murder, war, etc.); relations of aging and death; implications of changing death patterns for individuals, families, organizations, and societies in this nuclear age.
Mr. Gordon

436. Sociology of Literature (3-0-3).
Examination of social actors and institutions involved in production, dissemination, and reception of literature: authors, publishers, and other literary "gatekeepers;" critics who shape the literary canon; and audiences—what they read and how books ("good" or "trash") function in their lives.
Ms. Long

470. Popular Culture (3-0-3).
Analysis of social origins, significance, and implications of various types of media, arts, and popular entertainment. Enrollment limited.

Staff

475. Social Movements (3-0-3).
This course examines both the historical development and contemporary relevance of social movements in an empirical and theoretical context. Examination of the classical literature on collective behavior and social movements, as well as recent criticisms of these perspectives. Utilization of these historical data and theoretical approaches to assess the impact and potential future of social movements in Europe and the U.S.

Mr. Tucker

481. Perspectives on the Future (3-0-3).
An exploration of the major processes underlying the transformation of industrial societies, with particular reference to the impact of technological developments and environmental constraints, as they interact with human values and aspirations, to shape the contours of the future.

Mr. Klineberg

492. Directed Honors Research (3-0-3).
Sociological research under faculty supervision. First semester: review of relevant literature and preparation of outline for planned research. Second semester: research carried out and honors thesis completed. Open only to students in sociology honors program.

493. Directed Honors Research (3-0-3).
Sociological research under faculty supervision. First semester: review of relevant literature and preparation of outline for planned research. Second semester: research carried out and honors thesis completed. Open only to students in sociology honors program.

496. Research: Houston Area Survey (3-0-3).
The "research team" will continue the series of annual surveys exploring the ways Houston residents are reacting to changes in American society. By participating fully in sampling procedures, questionnaire construction, interviewing, and data analysis, students will gain direct experience with the logic and skills of survey research, in a project of professional quality.

Mr. Klineberg

Space Physics and Astronomy

Professor Dessler, *Chair*
Professors Chamberlain, Clayton, Cloutier, Dufour,
Dunning, Few, J.W. Freeman, *Assistant Chairman,* **Haymes**
Heymann, Michel, O'Dell, Stebbings, Walters, and Wolf
Assistant Professor Dressel
Adjunct Assistant Professors Jost, Noble, and Newman
Senior Research Scientists Hill, Reiff and Voigt
Associate Research Scientist Smith
Assistant Research Scientist Ledley

Degrees Offered: B.A. in physics with space physics and astronomy option, M.S., Ph.D.

Undergraduate Program. There is no undergraduate major in the department; however, the Department of Physics offers a space physics and astronomy option leading to a B.A. with a major in physics for students with an interest in studies directed toward space physics and astronomy. The course requirements for this option can be satisfied in any order consistent with prerequisites. The following is a typical program (laboratory courses in parentheses):

First Year:	Physics 101, 102, or 111, 112 (132)
	Mathematics 101, 102
	Chemistry 101, 102 (107)
Second Year:	Space Physics and Astronomy 251, 252 (262)
	Physics 201, 202 (231)
	Mathematics 211, 212
Third Year:	Physics 301, 302 (331, 332)
	Physics 311, 312
	Mathematics or Mathematical Sciences elective
Fourth Year:	Space Physics and Astronomy 471 (431, 432)
	Physics 425
	Math elective

Additional courses in space physics, electrical engineering, mathematics, computer science, geology, and other subjects may be helpful to undergraduates enrolled in the space physics option. The department has prepared a list of such courses and should be consulted prior to registration. In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 140 semester hours. See Degree Requirements and Majors, pages 54-68.

Graduate Program. Research opportunities exist for graduate studies leading to degrees of Master of Science and Doctor of Philosophy in the Department of Space Physics and Astronomy. To gain such a degree, a student must be knowledgeable in many areas of space physics and astronomy and expert in at least one.

Because of the interdisciplinary nature of the Department's activities, holders of bachelor's degrees in astronomy, chemistry, electrical engineering, geophysics, physics, or any of several other scientific and engineering disciplines may apply for admission to graduate study in the department. Research programs in the Department of Space Physics and Astronomy include astronomy, astrophysics, atmospheric electricity, atomic physics, experimental and theoretical space plasma physics, meteoritics, and planetary atmospheres.

The requirements for M.S. and Ph.D. degrees are outlined below. A booklet giving more detailed and specific information is available from the departmental office.

Requirements for the Degree of Master of Science. Candidates for the master's degree must complete successfully at least 30 semester hours of approved graduate level studies and must demonstrate an understanding of physics and astronomy in an oral examination by their faculty committee. They must prepare a written thesis on an original research topic and defend the thesis orally.

Requirements for the Degree of Doctor of Philosophy. The basic requirement for a doctorate is demonstration of the capacity for independent, original research. Additional formal requirements are indicated below.

A student is normally admitted to candidacy for the Ph.D. degree by satisfying the requirements for the M.S. degree in space physics and astronomy as outlined above. A student who already holds a recognized M.S. degree or who does not desire to receive a master's degree may become a candidate for the Ph.D. through procedures described in the booklet available from the departmental office.

Candidates who hold a master's degree could possibly complete requirements for the doctorate in two years; however, a minimum of three years' graduate study is normally required. Students must complete at least 60 semester hours of approved graduate level studies, prepare a thesis on an original research topic, and defend the thesis orally. The thesis must be of a quality acceptable for publication in a reputable scientific journal. Further details of research programs in space physics and astronomy and departmental degree requirements are contained in a pamphlet available on request from the Department of Space Physics and Astronomy.

Space Physics and Astronomy Courses

201a. Stars, Galaxies and the Universe (3-0-3).
An introductory course for students in academic programs. The formation, evolution, and death of stars; the composition and evolution of galaxies; the structure and evolution of the universe. No prerequisites.

Mr. O'Dell

202b. The Solar System (3-0-3).
An introductory course for students in academic programs. Motions of planets; the moon and eclipses; structure and energetics of the sun; recent discoveries about the planets and their moons.

Mr. Chamberlain

235a. Space Colonies (3-0-3).
Physics of the planetary and space environment, reforming planets to make them habitable, calculation of spacecraft orbits, design and construction of large space structures, power generation, and specialized manufacturing.

Mr. Dessler

251a. Introduction to Space Physics and Astronomy I(3-0-3).
Recommended for S-E majors. Celestial sphere, the properties and evolution of the solar system and its components, and basic stellar characteristics. Prerequisite: Mathematics 211 and one year of college physics.

Mr. Dufour

252b. Introduction to Space Physics and Astronomy II(3-0-3).
The structure and evolution of stars and galaxies will be discussed, as well as cosmological theories. Concurrent enrollment in Space Physics and Astronomy 262 recommended. Prerequisite: Space Physics and Astronomy 251.

Mr. Dufour

262b. Observational Laboratory (1-3-2).
Astronomical coordinates, telescopes, astrophotography, photometry, and spectroscopy. Required for space option majors.

Miss Dressel

431a. Senior Research (0-6-2).
For majors in the space option.

Mr. Dufour, Mr. Phillips

432b. Senior Research (0-6-2).
For majors in the space option.

Mr. Dufour, Mr. Phillips

433a. Honors Research I (0-9-3).
Student pursues a research project similar to Space Physica and Astronomy 431, 432 in considerably greater depth. Prerequisite: permission of the department.

Mr. Dufour

434b. Honors Research II (0-9-3).
Student pursues a research project similar to Space Physics and Astronomy 431, 432 in considerably greater depth. Prerequisite: permission of the department.

Mr. Dufour

443a. Introduction to Atmospheric Science (3-0-3).
Fundamentals of meteorology and climatology; radiation and energy balance, measurements, thermodynamics, clouds, weather systems and motions on small and global scales. Also offered as Environmental Science 443 and Mechanical Engineering 477.

Mr. Few

471a. Solar System Physics (3-0-3).
Solar-terrestrial relationships, solar wind, planetary atmospheres, ionospheres, and magnetospheres. Prerequisite: Space Physics and Astronomy 251, 252, 262; Physics 301, 302, 311, 312 or equivalent.

Mr. Haymes

472b. Modern Astronomy and Astrophysics (3-0-3).
Observational and theoretical aspects of the generation of corpuscular, electromagnetic, and gravitational radiation in astronomical objects. Prerequisite: Space Physics and Astronomy 251, 252, 262; Physics 301, 302, 311, 312 or equivalent.

Mr. Haymes

503a. Plasma Astrophysics I (3-0-3).
Magnetohydrodynamics, gas dynamics, particle drifts, electrical conductivities. Emphasis on applications.

Mr. Cloutier

504b. Plasma Astrophysics II (3-0-3).
Plasma, waves, confinement, and instabilities. Emphasis on applications.

Mr. Michel

507a. Research Topics (2-0-1).
A presentation of current research programs in the department.

508b. Research Topics (2-0-1).
A presentation of current research programs in the department.

512b. Planetary Atmospheres (3-0-3).
Inospheres: their aeronomy and propagation of radio waves; airglow; and aeronomy of neutral gases; exopheric structure; stability of planetary climate changes. Text: *Theory of Planetary Atmospheres* by Chamberlain.

Mr. Chamberlain

515a. Advanced Classical Mechanics (3-0-3).
Langrangian and Hamiltonian dynamics, normal vibrations, rigid body motion, the transformation theory of dynamics, and the covariant formulation. Also offered as Physics 515.

521a. Quantum Mechanics I (3-0-3).
Also offered as Physics 521.

522b. Quantum Mechanics II (3-0-3).
Also offered as Physics 522.

531a. Electromagnetic Theory I (3-0-3).
Also offered as Physics 531.

Mr. Wolf

532b. Electromagnetic Theory II (3-0-3).
Also offered as Physics 532.

Mr. Cloutier

535b. The Solar System (3-0-3).
The basic physical features of the solar system and its planets and satellites are examined with special emphasis on clues to the origin of the solar system. Theories of the origin and formation of the solar system are examined critically.

Mr. Freeman

537a. Cosmochemistry I (3-0-3).
Chemistry of interstellar media.

Mr. Heymann

551a. Stellar Interiors (3-0-3).
The physics governing stellar structure and evolution is described. Major topics are: equation of state of dense matter and thermodynamic principles; energy transport in stars; thermonuclear reations and power; computation of stellar structure; nuclear evolution through helium burning. Also offered as Physics 551.

Mr. Clayton

552b. Stellar Atmospheres and Gaseous Nebulae(3-0-3).
The theory of radiative equilibrium and energy transfer in stellar photospheres and low density plasmas will form a foundation for the course. The lectures will then proceed to study stellar continuous emission and the formation of line spectra. Outflowing mass in the form of stellar winds naturally conclude the sections on stellar atmosphere and lead to the parts on gaseous nebulae. The fundamental processes of nebular emission and energy trnsfer will be emphasized. The application of these processes to actual galactic and planetary nebulae will be included. The dynamics of nebulae will be studied with the goal of understanding the expected evolution. The final sections will be on the large scale features of the interstellar medium.

Mr. O'Dell

554b. Nucleosynthesis (3-0-3).
Advanced stellar evolution leading to the supernova, accompanied by the details of nuclear evolution. Heavy element nucleosynthesis (**e**-process, **f** -process, **r** -process, **p** -process) are quantitatively treated. Comparisons of theory with data on abundances of the nuclei. Other topics include: origin of light elements, the Big Bang, radioactive chronologies, isotopic anomalies, more reaction rate theory.

Mr. Clayton

564b. Atmospheric Dynamics (3-0-3).
Hydrodynamic equations of motion on a rotating planet solved for static, and perturbed and instable flows for mesoscale and macroscale weather systems on earth and other planets. Also offered as Environmental Science 564.

Mr. Few

595a. Teaching Space Physics and Astronomy(Variable).
For graduate students.

596b. Teaching Space Physics and& Astronomy(Variable).
For graduate students.

605b. Magnetospheric Physics (3-0-3).
Magnetospheric theory and phenomena, including interactions with the solar wind and with the ionosphere and neutral atmosphere. A brief qualitative overview of the Earth's magnetosphere is presented first, including terminology and basic phenomena. Topics covered in more detail include: flow of the solar wind around the magnetosphere; the open and closed models of the magnetosphere; magnetic reconnection; magnetic structure of the magnetosphere; theory of bounce-averaged particle drifts; the trapped-radiation belts; ionospheric conductivities; theory of ionosphere-magnetosphere coupling; magnetospheric convection; magnetospheric substorms; magnetic-field-aligned electric fields and aurora; survey of wave and instability phenomena.The Earth's magnetosphere will be compared to those observed at Jupiter, Saturn, Mercury, and in pulsars.

Mr. Wolf

607a. Astrophysical Plasmas (3-0-3).
Applications of plasma physics in descriptions of the solar wind and corona; interstellar medium, interstellar clouds, filaments, and shocks; cometary processes; magnetic braking of stellar rotations, stellar wind interation with protoplanets, plasma processes in stellar and protoplanets collapse, pulsar magnetospheres.

Mr. Cloutier, Mr. Michel

660a. Gravitation And Relativity (3-0-3).
A comparison of theories of gravitation. Einstein's general theory of relativity will be described fully, and the known tests of the theory will be calculated. Relativistic cosmology will also be introduced via the field equations for the universe.

Mr. Michel

800a,b. Graduate Research (Variable).

Spanish, Portuguese, and Classics

Associate Professor Urrutibéheity, *Chair*
Professors Castañeda, Leal, and Levin
Associate Professors Rea, Valdivieso, and Wallace
Assistant Professors Kauffmann, Pérez, Yamal, and Yunis
Lecturers Daichman, Eaker, and Kiperman

Degrees Offered: B.A. and M.A. in Spanish; B.A. in Classics

Study is offered in Classics, Greek, Latin, Portuguese, and Spanish. A fully equipped language laboratory is in operation. Laboratory work is required of students in the beginning classes of all modern languages.

Qualified upperclass students may engage in independent work at the discretion of the department.

Spanish

Undergraduate Program. A student majoring in Spanish may pursue the following options: (1) language, (2) literature, or (3) Latin American studies. For an option in language or literature, 30 semester hours (ten courses) offered in fulfillment of major requirements must be Spanish courses numbered 300 or higher. For an option in Latin American studies, a minimum of 18 semester hours (six courses) in Spanish courses numbered 300 or higher must be taken, plus six semester hours (two courses) of Portuguese, and at least 12 semester hours (four courses) related to the Latin American field in other departments. Qualified upperclass students are offered an opportunity to earn up to six semester hours in independent work. For specific requirements as to courses and the sequence to be followed, see the departmental advisers. All majors must have their programs approved by the department.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 54-68.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department; normally, this includes 24 semester hours in advanced courses plus six semester hours of thesis work.
2. Satisfactory performance on a reading examination in one foreign language other than Spanish approved by the department.
3. Satisfactory performance on a written comprehensive examination in Spanish, which tests the student's mastery of the chosen area of specialization and general competence in the remaining areas of Hispanic literature and linguistics.
4. One semester of college Latin or equivalent.
5. One semester of "Teaching College Spanish" and practice teaching.
6. Completion of an acceptable thesis.
7. Satisfactory performance on a final oral examination on the thesis.

Summer Graduate and Undergraduate Program. Each summer since 1973, the Department of Spanish has offered programs designed to prepare students to study the Spanish language and do research on Spanish Literature and Linguistics. The program has now been permanently established in Seville, Spain. Partial scholarships are available.

Spanish Courses

101a,b. First-Year Spanish (3-1-4).
Introduction to the study of the Spanish language with emphasis on the development of audio-lingual skills. Language laboratory work required.

Staff

102a,b. First-Year Spanish (3-1-4).
Continuation of Spanish 101.

Staff

103a. Accelerated Beginning Spanish (6-2-8).
Double course comparable to Spanish 101, 102 designed to achieve in one semester maximum proficiency in spoken language. Five classes a week, language lab twice a week.

Mr. Urrutibéheity, Staff

103c. Accelerated Beginning Spanish (6-2-8).
Summer program in Spain (see 103a).

Staff

201a,b. Second-Year Spanish (3-1-4).
Contemporary short stories and essays provide current linguistic models and serve as the point of departure for class conversation and discussion. Thorough grammar review.

Staff

202b. Second-Year Spanish (3-1-4).
Continuation of Spanish 201.

Mr. Kauffmann, Staff

204b. Accelerated Intermediate Spanish (6-2-8).
Continuation of Spanish 103 comparable to Spanish 201, 202. Contemporary short stories provide current linguistic models and serve as the point of departure for class conversation and discussion.

Ms. Rea, Ms. Daichman

219a. Spanish for Bilingual Students (3-0-3).
A systematic comparison of the linguistic structures of English and Spanish, and a survey of the lexical differences between Peninsular Spanish and the Spanish spoken in Texas and Northern Mexico. Offered alternate years.

Mr. Urrutibéheity

280c. Spanish Conversation (3-0-3).
Intensive practice in the oral use of the language. Newspaper and magazine articles as well as interviews with native speakers are used as a basis for discussions. Grammar is reviewed incidentally. Emphasis on vocabulary acquisition and development of oral fluency. Offered in Summer program in Spain only.

Mr. Urrutibéheity, Staff

303a. Spanish Literature in Translation (3-0-3).
Selected works of outstanding Spanish writers. Readings and class discussion in English. Open to all students. Does not count toward a major in Spanish. Offered occasionally.

Mr. Castañeda

304b. Latin-American Literature (3-0-3).
Selected works of outstanding writers from Latin America. Readings and class discussions in English. Open to all students.

Ms. Rea

305a. Intermediate Spanish: Legal and Commercial(3-0-3).
Introduction to general business and legal practices and terminology useful in subsequent business or legal career. Prerequisite: second-year proficiency or permission of instructor.

Ms. Kiperman

306b. Intermediate Spanish: Medical (3-0-3).
Introduction to general medical terminology and the reading of medical texts and journals. Useful in subsequent medical career. Prerequisite: second year proficiency or permission of instructor. Offered alternate years.

Ms. Kiperman

311a, 312b. Advanced Spanish (3-0-3 each semester).
Third-year course designed primarily to improve spoken language. Emphasis is on new vocabulary and idioms, morphology, syntax, and mechanisms of interference.

Mr. Yamal, Staff

318c. Spanish Conversation: Advanced Level (3-0-3).
Intensive practice in the oral use of the language. Movies, essays, and short stories are used as a basis for conversation. Offered in Summer program in Spain only.

Mr. Urrutibéheity

319a, 320b. Survey of Spanish Literature (3-0-3 each semester).
The history of Spanish literature through representative readings from the medieval period to the present. Offered alternate years.

Mr. Pérez

321a, 322b. Survey of Spanish-American Literature (3-0-3).
The main literary trends and outstanding writers in Spanish America. Offered alternate years.

Ms. Rea, Ms. Valdivieso

323a. Hispanic Culture and Civilization (3-0-3).
Topics relating to the development of social, political, and economic institutions of Spain.

Mr. Kauffmann, Mr. Pérez

324b. Culture and Civilization of Latin America (3-0-3).
The development of social, political, and economic institutions of Latin America forms the basis for extensive conversation, discussion, and composition.

Ms. Valdivieso

341a, 342b. Spanish Literature from 1800 to Present (3-0-3 each semester).
Offered alternate years. Topic for fall 1987: the essay.

Mr. Kauffmann, Mr. Pérez

352b. Spanish Rhetoric and Composition (3-0-3).
Designed to strengthen written rhetorical skills by using such materials as films, literary texts, and current periodicals. Offered alternate years.

Mr. Pérez

361a, 362b. Golden Age Drama (3-0-3 each semester).
Development of the "comedia," illustrated by selected works of Lope de Vega, Tirso de Molina, Ruiz de Alarcón, Calderón de la Barca, and other seventeenth-century playwrights. Offered alternate years.

Mr. Castañeda

381a, 382b. Prose and Lyric Poetry of the Golden Age (3-0-3 each semester).
Analysis of poetry and prose emphasizing mysticism, the development of lyric poetry from Garcilaso to Gongora, the picaresque novel, and Cervantes. Offered alternate years.

Mr. Castañeda

403a. Advanced Spanish Through Media (3-0-3).
Course for advanced undergraduates. Emphasis on perfecting listening comprehension and speaking ability. Topics for oral expression developed from selected Spanish-language films to be viewed in class. Recommended for students interested in maintaining or improving near-native or native command of the language.

Ms. Daichman

405a, 406b. Spanish-American Literature (3-0-3 each semester).

Ms. Rea, Ms. Valdivieso

411a, 412b. Medieval and Renaissance Spanish Literature (3-0-3 each semester).
Topic for fall 1987: Three medieval masterpieces: Cantar de Mio Cid, Llibro de Buen Amor, and La Celestina.

Ms. Leal

415a, 416b. The Art and Mechanics of Translation (3-0-3 each semester).
Intensive practice in Spanish-English, English-Spanish translation. Introduction to the techniques of consecutive and simultaneous interpretation. Lab work required. Prerequisite: Spanish 311 or equivalent. Offered alternate years.

Ms. Daichman

420b. Literary Semiotics (3-0-3).
Application of semiotic models to the study of literature. Also offered as Linguistics 420.

Mr. Kauffmann

421a, 422b. Independent Work: Special Topics (3-0-3).
Hispanic literature, Hispanic linguistics, and Hispanic culture and civilization. Reserved for qualified juniors and seniors who are particularly interested in a topic not covered in other courses. Prerequisite: permission of the department.

Staff

423a. Linguistic Structure of Spanish (3-0-3).
A synchronic study of modern Spanish phonology, morphology, and syntax. Special attention given to Hispanic-American variants. Also offered as Linguistics 423.

Mr. Urrutibéheity

507a. Teaching College Spanish (1-0-1).
Teaching methods and techniques, test preparation, and evaluation. One hour per week of discussion. Students observe language class one week, teach three weeks. Required for graduate students.

Mr. Urrutibéheity

511a, 512b. Methods of Research in Hispanic Literature (3-0-3).
Theoretical and practical course for beginning graduate students. Emphasis on techniques of stylistic and linguistic analysis and on the bibliographical resources in the field.

Staff

516b. Studies in Hispanic Linguistics (3-0-3).
May be repeated for credit when topics vary. Topic for spring 1988: "Old Spanish." Also offered as Linguistics 516.

Mr. Urrutibéheity

517a, 518b. Studies in Medieval Spanish Literature (3-0-3).
Topic for fall 1987: Cantar de Mio Cid, Libro de Buen Amor, La Celestina. Offered alternate years.

Ms. Leal

523a, 524b. Studies in Golden Age Theatre (3-0-3).

Mr. Castañeda

525a, 526b. Studies in Spanish Golden Age Prose and Lyric Poetry(3-0-3).

Mr. Castañeda

535a, 536b. Studies in Nineteenth Century Spanish Literature (3-0-3 each semester).
Major writers of the nineteenth century. Topic for fall 1987: the essay.

Mr. Kauffmann, Mr. Pérez

541a, 542b. Studies in Twentieth Century Spanish Literature (3-0-3 each semester).
Major writers of the twentieth century. Special topics.

Mr. Pérez, Mr. Kauffmann

555a, 556b. Spanish American Literature (3-0-3 each semester).

Ms. Rea, Mr. Yamal

566b. Studies in the Culture and Civilization of Spain and Latin America (3-0-3).
Not offered every year.

Staff

575a, 576b. Romance Linguistics (3-0-3 each semester).
Not offered every year.

Mr. Urrutibéheity

591a, 592b. Independent Study (Variable each semester).

Staff

700c. Summer Graduate Research

Staff

701a, 702b. Research Leading to Candidacy (Variable each semester).
Topics in Spanish and Latin American Literary theory and Spanish Linguistics. To be taken after a student has completed departmental course requirements for the master's, and before being admitted to candidacy.

800a,b. Thesis Research (Variable each semester).

Portuguese Courses

101a, 102b. First-Year Portuguese (3-1-4 each semester).
Introduction to the study of the Portuguese language with emphasis on development of audio-lingual skills. Language laboratory work required.

Ms. Leal

201a, 202b. Second-Year Portuguese (3-0-3 each semester).

Ms. Leal

311a, 312b. Advanced Portuguese (3-0-3 each semester).

Ms. Leal

400b. Independent Study: Special Topics in Luso-Brazilian Literature and Linguistics (0-0-3).
Reserved for qualified students particularly on a topic not covered in other courses. Prerequisite: permission of the department.

Ms. Leal

Classics

Requirements for the Undergraduate Major in Classics. A student majoring in classics must take 30 semester hours (ten courses) in classics, Greek, and Latin, of which 24 semester hours (eight courses) must be at the 300 level or above. A double major requires 30 semester hours (ten courses), with at least 18 (six courses) at the 300 level or above. All prospective programs for individuals majoring in classics are to be drawn up in consultation with members of the classics staff.

Classics Courses

211a. Classical Civilization: Greece (3-0-3).
Introductory survey of the various aspects of ancient Greek culture, including political and social history, art and architecture, religion, philosophy, and literature.
Ms. Wallace

212b. Classical Civilization: Rome (3-0-3).
Introductory survey of the various aspects of Roman civilization, including the rise of Christianity, political and social history, art and architecture, religion, philosophy, and literature.
Ms. Wallace

214b. Greek and Latin Elements in English (3-0-3).
The relationship of English to the classical languages; a systematic guide to understanding vocabulary and an example of historical and cultural development. Does not count toward a major in classics.
Ms. Eaker

215. Socrates: The Man and His Philosophy (3-0-3).
Mr. Yunis

311a. Athens in the Peloponnesian War (3-0-3).
A reading of Thucydides' *History of the Peloponnesian War,* together with plays of Sophocles, Euripides, and Aristophanes that were produced at Athens during the war years.
Ms. Wallace

312b. The Archaic Age in Greece (3-0-3).
A study of Greek culture from ca. 750 to 450 B.C. Authors include Homer, Hesiod, the lyric poets, Pindar, Aeschylus, and Herodotus. (This is a companion to Classics 311a, introduced in Fall 1983, though each course will be independent and may be taken without the other.)
Ms. Wallace

335b. Classical Mythology (3-0-3).
Survey of Greek myths and their extension to Rome and modern European literature. All works are read in English translation.
Mr. Levin

336b. Classical Mythology (3-0-3).
Survey of Greek myths and their extension to Rome and modern European literature. All works are read in English translation.
Mr. Levin

352. Periclean and Demosthenean Athens (3-0-3).
Mr. Yunis

491a. Special Topics (3-0-3).
Independent work for qualified juniors and seniors.
Ms. Wallace

492b. Special Topics (3-0-3).
Independent work for qualified juniors and seniors.
Ms. Wallace

Greek Courses

201a. Elementary Greek I (3-0-3).
Fundamentals of ancient Greek grammar with emphasis on acquisition of reading skills.
Ms. Eaker

202b. Elementary Greek II (3-0-3).
Continuation of Greek 201.
Ms. Eaker

301a. Intermediate Greek I (3-0-3).
Review of forms and syntax followed by readings in Greek prose (New Testament and Herodotus).

Ms. Eaker

302b. Intermediate Greek II (3-0-3).
Homer: Reading of selections from *The Odyssey*.

Ms. Wallace

491a. Directed Reading (0-0-3).
Independent work for qualified juniors and seniors in genres or authors not presented in other courses.

Mr. Yunis

492b. Directed Reading (0-0-3).
Independent work for qualified juniors and seniors in genres or authors not presented in other courses.

Mr. Yunis

Latin Courses

101a. Elementary Latin I (3-0-3).
Fundamentals of Latin grammar with emphasis on acquisition of reading skill.

Ms. Wallace

102b. Elementary Latin II (3-0-3).
Continuation of Latin 101.

Ms. Wallace

201a. Intermediate Latin I (3-0-3).
Review of grammar followed by reading of Pliny and practice in prose composition. Prerequisite: Latin 101, 102 or equivalent.

Ms. Eaker

303a. The Structure of Latin (3-0-3).
A concentrated one-semester course in the morphology and syntax of Latin, with brief readings from classical and medieval texts. Designed primarily for graduate students, undergraduates admitted only by permission of instructor.

Staff

312b. Medieval Latin (3-0-3).
Readings in medieval Latin prose and poetry. Not open to freshmen. Prerequisite: Latin 101, 102 or equivalent.

Ms. Eaker

401a. Plautus and Terence (3-0-3).
Reading of two plays in Latin, others in English, with consideration of Plautus and Terence in the Western comic tradition. Prerequisite: Latin 201 or four years of high school Latin.

Ms. Wallace

402b. Roman Elegy (3-0-3).
Readings in the elegies of Tibullus and Propertius, with some attention to elegiac writings of Catullus and Ovid.

Mr. Levin

491a. Directed Reading (3-0-3).
Independent work for qualified juniors and seniors in genres or authors not presented in other upper level courses.

Staff

492b. Directed Reading (3-0-3).
Independent work for qualified juniors and seniors in genres or authors not presented in other upper level courses.

Staff

Statistics

Professor J.R. Thompson, *Chairman*
Professors J.W. Brelsford, P.E. Pfeiffer, D.W. Scott, and R. Sickles
Adjunct Professors Brown, Cardus, Downs, Frankowski, Gehan, Gentle, Hsi Jansson, Thames, and Zimmerman
Associate Professors J.D. Austin, B.W. Brown, and D.M. Lane
Adjunct Associate Professors Hacker, Johnston, and White
Assistant Professors S.-T. Chiu, K. B. Ensor, and R.K. Wilson
Adjunct Assistant Professor Atkinson

Degrees Offered (Pending Faculty Approval): B.A., M.Stat., M.A., Ph.D.

Undergraduate Program. (Pending Faculty Approval)
The Department's goals are to acquaint students with the role played in the modern world by probabilistic and statistical ideas and methods, to provide instruction in the theory and application of techniques that have been found to be commonly useful, and to train research workers in statistics. The undergraduate statistics program is flexible and may be oriented toward theoretical or applied training or toward joint work in a related department, such as Economics, Education, Electrical and Computer Engineering, Mathematical Sciences, Political Science, and Psychology.

1. Students normally take seven basic courses:
   Calculus: Mathematics 101, 102
   Differential equations and linear algebra: Mathematics 211
   Computer programming: Computer Science 211 or Mathematical Sciences 223
   Model building: Statistics 300 or 301
   Introduction to Probability and Statistics: Statistics 382
   Data Analysis: Statistics 480

2. Students also take five elective courses (three elective courses for double majors) from the Statistics Department at the 300-level or higher.

Mathematically oriented students should also take Mathematics 212 and 355 (or Mathematical Sciences 310). In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours.

Graduate Program. Graduate programs at three levels are offered: master's without thesis (M.Stat), master's with thesis (M.A.), and doctoral degree (Ph.D.). Applicants should request application materials and provide Graduate Record Examination scores (quantitative, verbal, and advanced), transcripts, three letters of recommendation, and TOEFL scores when appropriate. Support is available for well-qualified doctoral students.

Thirty semester hours of approved course work must be completed for master level degrees, with 90 hours required for the doctoral degree. Course work is expected at the

400-level and above, but two approved 300-level courses may be offered. An original thesis with public oral defense is required for the M.A. and Ph.D. degrees. Doctoral students must perform satisfactorily on preliminary and qualifying examinations, and pass a reading examination in one foreign language.

Statistics Courses

280. Introduction to Statistical Methods (3-0-3).
A noncalculus introduction to statistical methods with emphasis on techniques.

300. Model Building (3-0-3).
Examples to illustrate mathematical formulation (modeling) of scientific problems, their solution and interpretation. Emphasis on physical science models.

301. Model Building (3-0-3).
Same as Statistics 300, with emphasis on behavioral science models.

339. Statistical Methods in Psychology (3-1-4).
Introduction to quantitative and computer methods applicable to analysis of experimental data. Prerequisite: Psychology 201 and permission of instructor. Also offered as Psychology 339.

381. Introduction to Applied Probability (3-0-3).
Concepts, interpretations, elementary techniques, and applications of modern probability theory. Prerequisite: Mathematics 102. Also offered as Mathematical Sciences 381 and Electrical and Computer Engineering 331.

382. Introduction to Probability and Statistics(3-0-3).
Probability theory and the central concepts and methods of statistics. Prerequisite: Mathematics 102; Mathematics 212 is recommended.

400. Econometrics (3-0-3)
Estimation and forecasting models; topics include multiple regression time series, contingency table analysis, and Baysian inference. Also offered as Economics 400 (see for prerequisites).

429. Tests and Measurements (3-0-3).
Techniques for measuring individual differences and critical review of theories of individual differences in intelligence and personality. Also offered as Psychology 429 (see for prerequisites).

480. Statistical Data Analysis (3-1-4).
A survey of statistical computing as it relates to distribution theory, estimation theory, and hypothesis testing. Prerequisite: Statistics 382 and programming.

481. Introduction to Mathematical Statistics I(3-0-3).
Estimation theory. Distribution theory. Central limit theorem. Bayes theorem. Admissibility and minimaxity. Maximum-likelihood estimation. Gauss-Markov theorem. Cramer-Rao inequality. Prerequisite: Statistics 382 or 381.

482. Introduction to Mathematical Statistics II(3-0-3).
Hypothesis testing. Confidence intervals. Neyman-Pearson theory. Uniformly most powerful tests. Nonparametric tests. Kolmogorov-Smirnov tests. Prerequisite: Statistics 481.

483. Markov and Martingale Sequences. Renewal Processes (3-0-3).
The Markov property and Markov sequences. Discrete-parameter martingales. Poisson and other renewal processes. Prerequisite: Statistics 381. Also offered as Mathematical Sciences 483. Not offered every year.

486. Linear Models (3-0-3).
Multivariate normal distribution. Multiple and partial correlation. Wishart distributions. Prerequisite: linear algebra and Statistics 481.

487. Multivariate Analysis (3-0-3).
Continuation of Statistics 486. Hotelling's T. Fisher's linear discriminant function. Principal component analysis. Multivariate analysis of variance and nonformal distributions.

488. Bayesian Foundations of Statistical Inference(3-0-3).
Bayes' theorem. Vague prior knowledge and natural conjugate priors. Inference for multivariate distributions. Approximation methods. Likelihood principle.

495. Introduction to Statistics (3-0-3).
Investigation of basic concepts of statistics and their application to substantive problems in the social sciences. Prerequisite: permission of instructor. Also offered as Political Science 495.

490,491. Independent Study in Statistics (Credit variable).

503. Special Topics in Research Methods and Data Analysis (3-0-3).
Applications of least squares and general linear model. Also offered as Political Science 503. Not offered every year.

509,510. Advanced Psychological Statistics (3-0-3 each semester).
Descriptive and inferential statistics for beginning graduate students. Prerequisite: permission of instructor. Also offered as Psychology 509, 510.

Topics in Quantitative Methods and Research Design(3-0-3).
Also offered as Psychology 514.

533. Introduction to Random Processes and Applications (3-0-3).
Formulation, analysis, representation, and applications of some standard random processes. Also offered as Electrical and Computer Engineering 533 (see for prerequisites) and Mathematical Sciences 583.

534. Estimation Theory (3-0-3).
Maximum likelihood and Bayesian vector parameter estimation. Minimum mean square-error estimation. Times series analysis. Algorithms based on state variable and ARMA models for signal estimation, model identification, and spectral estimation. Also offered as Electrical and Computer Engineering 534 (see for prerequisites) and Mathematical Sciences 584.

535. Information and Coding Theory (3-0-3).
Information theory concepts. Basic theorems of channel coding. Parity-check codes. Variable-length source coding. Also offered as Electrical and Computer Engineering 535 (see for prerequisites) and Mathematical Sciences 585.

580. Introduction to Statistical Method (3-0-3).
A survey of distribution theory, estimation theory, and hypothesis testing. Intended for graduate students in other departments.

581. Mathematical Probability I (3-0-3).
Measure-theoretic foundations of probability. Open to qualified undergraduates. Also offered as Mathematical Sciences 581.

582. Mathematical Probability II (3-0-3).
Continuation of Statistics 581. Also offered as Mathematical Sciences 582.

586,587,588,589. Advanced Topics in Theoretical Statistics (3-0-3).
Topics in this two-year sequence include: Monte Carlo techniques, time series analysis, nonparametric statistics, hypothesis testing, and regression theory.

600. Graduate Seminar in Statistics (3-0-3).

604. Advanced Economic Statistics (3-0-5).
Statistical inference and the testing of hypotheses; multiple and partial correlation analysis; analysis of variance and regression. Also offered as Economics 504.

610. Econometrics (3-0-5).
Estimation and testing in econometric models:theoretical and applied econometrics. Also offered as Economics 510 (see for prerequisites).

611. Applied Econometrics (3-0-5).
Estimation and testing of systems of equations, consumer demand systems, production functions, econometric models. Also offered as Economics 511.

686,687,688,689. Advanced Topics in Applied Statistics(3-0-3).
Topics in this two-year sequence include: bioassay, sampling theory, survival studies, experimental design, analysis of variance, data analysis, and density estimation.

800a,b,c. Thesis (Credit variable).

Academic Calendar 1987-88

First Semester

Monday, August 17	Orientation for new students
Monday, August 24	FIRST DAY OF CLASSES
Monday, August 24—Monday, August 31	Registration for continuing students
Friday, September 4	Deadline for adding or dropping courses without fee, 5 p.m.
Monday, September 7	Labor Day Holiday
Friday, September 18	Deadline for adding courses to schedule and for designating *Pass/Fail,* 5 p.m.
Friday, September 25	Deadline for instructors to turn in grades for *incompletes,* 5 p.m.
Wednesday, October 7	Last day for filing College course plans with the Office of the Vice-President for Student Affairs
Friday, October 9	Freshman mid-semester grades due
Monday, October 12—Tuesday, October 13	Mid-term recess
Wednesday, October 14	All classes normally held on Monday meet. All Wednesday classes are cancelled to equalize holidays by days of the week during the semester
Friday, October 30	Deadline for Ph.D. candidacy petitions, Office of Graduate Programs, 5 p.m.
Friday, October 30	Deadline for dropping courses or converting *Pass/fail* options to a letter grade, 5 p.m.
Friday, Saturday (October 30-31)	Parents' Weekend
Thursday, November 26—Friday, November 27	Thanksgiving recess
Friday, December 4	LAST DAY OF CLASSES
Wednesday, December 9	First day of final examinations
Wednesday, December 16	Last day of final examinations
Tuesday, December 22	All grades due, Registrar's Office, 5 p.m.

Second Semester

Thursday, January 7	FIRST DAY OF CLASSES
Thursday, January 7—Thursday, January 14	Registration for continuing students
Thursday, January 14—	Deadline for resolution of grades of *other,* 5 p.m.
Friday, January 22—	Deadline for adding or dropping courses without fee, 5 p.m.
Friday, February 5—	Deadline for adding courses to schedule and designating *Pass/Fail,* 5 p.m.
Friday, February 12—	Deadline for instructors to turn in grades for *incompletes,* 5 p.m.
Friday, February 12	Majors Day
Friday, February 26	Last day for filing College course plans with the Office of the Vice-President for Student Affairs
Friday, February 26,	Freshman mid-semester grades due

Tuesday, March 1	Deadline for Master's Degree Petitions, Office of Graduate programs, 5 p.m.
Monday, February 29— Friday, March 4	Mid-term recess
Saturday, March 12—	Deadline for dropping courses and for converting *Pass/Fail* options to a letter grade, 5 p.m.
Wednesday, March 30	Deadline for sophomores to file majors
Thursday, March 31— Friday, April 1	Spring recess (Easter: April3)
Friday, April 22	LAST DAY OF CLASSES
Saturday, April 23—	Final examinations for all degree candidates. Deadline for competing exams: 12 noon, Thursday, April 28
Wednesday, April 27	First day of finals for remaining students
Friday, April 29	Deadline for submission of theses for spring graduation, Office of Graduate programs, 12 noon
Saturday, April 30	Grades of all degree candidates due in Registrar's Office, 9 a.m.
Wednesday, May 4	Last day of final examinations
Saturday, May 7	SEVENTY-FIFTH COMMENCEMENT
Wednesday, May 11	Deadline for remaining grades in Registrar's Office, 5 p.m.
Friday, June 3	Deadline for resolution of grades of *other,* 5 p.m.

Index

Academic calendar, 1987-88, 340
Academic curricula, 54-68
Academic probation, 73
Academic regulations
  Undergraduate, 68-75
  Graduate, 111-113
Academic suspension, 73-74
Accounting, 62, 106, 122-132
Accounts, delinquent, 83
Administration, Jesse H. Jones Graduate School of, 106, 122-132
Administrative offices, 6
Admission, graduate, 110-111
  high school, special, 80-81
  undergraduate, 75-81
Advanced degree requirements, 106-109
Advanced placement, 79
Anthropology, 132-139
Apprenticeship plan for student teachers, 183
Architecture, 58, 107, 139-150
Area major, 64
Army Reserve Officers' Training Corps, 66
Art and Art History, 150-160
Astronomy, Space Physics and, 324-328
Athletic Department staff, 48-49
Athletics, Intercollegiate, 102-103
Auditing, 81
Automobile regulations, 103
Awards, graduate, 114-116
  undergraduate, 87-96
Baylor College of Medicine, joint graduate program, 109
Biochemistry, 161-165
Bioengineering, 108, 207-208
Biology, 165-169
Biophysics, 300
Board and room, 81, 83, 98
Board of Governors, 4
Brown, George R. School of Engineering, 58, 186-228
Calendar, academic, 1987-88, 340-341
Campus, 1
Campus map, 2-3
Candidacy, approval of, 110-111
Certification, teacher, 66, 181-182
  fees, 82
Chairs, endowed, 50-52
Chapel, Memorial, 102
Chemical Engineering, 187-192
Chemical physics, 300
Chemistry, 170-174
Chinese, 267
Circuits, control, and communications systems, 204, 206
Civil Engineering, 192-198
Class III students, 58, 80, 110
Classics, courses, 329-336
C.L.E.P., 79
College Board tests, 76-77
College courses, 99
College masters, 7, 98
Colleges, residential, 98
Committees, University Standing, 50
Computer Science, 198-203
Computer Services, Institute for, staff, 47-48
Continuing Studies and Special Programs, 46
Course programs, undergraduate, 54-66
Courses, deficiency, 73-74
  dropping, 68
  numbering, 121-122
  requirements, 55-56
Courses of instruction, 121-339
Credit, course, 55-56, 121
Curricula, overview, 54-66
Curricula, undergraduate, 54-66
  graduate, 105-109
Deficiencies, removal of course, 73-74
Degrees, graduate, 105-109
  professional, 106-109
  requirements for, 110-111
  research, 105-106

undergraduate, 54-66
Delinquent accounts, 83
Delta Phi Alpha, 97
Distribution requirements, 55-56
Dormitories, see residential colleges
Double majors, 57
Dropping a course, 68
Early decision admission, 77-78
Economics, 174-181
Education, 107, 181-186, teacher certification, 66, 181-182
Electrical and Computer Engineering, 108, 203-211
Emeritus faculty, 13-15
Employment, student, 87, 117
Engineering, 58, 108, 186-215
English, 229-236
Entrance examinations, 76-77
Entrance requirements, 79
graduate, 110-111
Environmental Science and Engineering, 108, 212-215
Eta Kappa Nu, 97
Examinations,
entrance, 76
final, 69
Exchange programs, 67-68
Expenses, graduate, 113-114
undergraduate, 81-83
Faculty, 13-44
Faculty, emeritus, 113-115
Fees, graduate, 113-114
undergraduate, 82
Fellowships, graduate 114-116
Film and Photography, 152-160
Financial aid
graduate, 117-118
undergraduate, 84-87
Fine Arts, see Art and Art History
Fondren Library, 101, 118
Foreign Study Programs, 66-68
French, 236-239
Geography courses, 247
Geology and Geophysics, 240-247
German, 247-250
Government, student, 99, 118-119
Governors, Board of, 4
Grade points and grade averages, 71
Grade symbols, 70
Grading guidelines, 71-73
Graduate admission, 110-111
Graduate approval of candidacy, 112-113
Graduate areas of study, 106-109
Graduate assistantships, see fellowships
Graduate Council, 118
Graduate degrees, 105-109
requirements, 110-111
Graduate fees, 113-114
Graduate fellowships, 114-116
Graduate language requirements, 106
Graduate oral examinations, 112-113
Graduate program in history and law with UH and TSU, 109
Graduate program with Baylor College of Medicine, 109
Graduate program with University of Texas Health Science Center at Houston, 110
Graduate Record Exam, 110-111
Graduate scholarships, 114-117
Graduate Student Association, 118-119
Graduate student government, 118-119
Graduate thesis regulations and procedure, 113
Graduation, 55, 75
Greek, 334-335
Health Service, 100-101
Health Service staff, 48
Health school students, special admission, 80
History, 257-266
History of Art, 150-161
Honor Council, 97
Honor Roll, President's, 73
Honor societies, 96-97
Honor system, 97-98, 118
Honors programs, 56-57
Housing, graduate students, 119
Housing, undergraduate, 81, 98
Human Performance and Health Sciences, 252-257
Humanities, School of, 59
Humanities, program, 265-266
Incomplete, course grade of, 66, 70-71
Institute for Computer Services and Applications, 102
staff, 47-48
Instructional staff, 13-44
Intercollegiate athletics, 102-103
Interim decision plan, 78
Internship plan for student teachers, 183-184
Interview for admission, 77
Intramural sports, 103
Italian, 239-240
Jones, Jesse H., Graduate School of Administration, 62, 106, 122-132

Language requirements, graduate, 106
Lasers, microwaves, and solid-state electronics, 204-211
Latin, 333-336
Law, joint graduate program, 109
Leave of absence, 74-75
Legal Studies Program, 64-65
Library, Fondren, 101, 118
Library, professional staff, 46-47
Linguistics and Semiotics, 267-272
Living expenses, 83-84
Loans, student, 86-87, 117-118
Major, approval of, 53
area, 60, 63-64
double, 57, 64
interdepartmental, 64
Majors offered, 61-62
Managerial studies, 62, 273
Marine Corps, NROTC, 293-294
Masters of residential colleges, 7, 98
Materials Science and Engineering, 108
Mathematical Sciences, 108, 217-221
Mathematics, 273-277
Mechanical Engineering, 108, 217-221
Medical Ethics, joint graduate program, 110
Memorial Center facilities, 101-102
Mentor Recognition Award, 99
Military Science, 66, 277-279
Music courses, 279-293
Music, Shepherd School of, 62-63, 109, 279-293
Natural Sciences, 60, 63
See also Biochemistry, Biology, Chemistry, Geology and Geophysics, Mathematics, Physics, and Space Physics and Astronomy
Naval Science, 293-295
Non-degree programs, see Class III
Numbering, course, 121
Offices, administrative, 6
Options for undergraduate majors, 63-64
Oral examinations, graduate, 112
Organizations, student, 99
Parking, 103
Pass-fail option, 69, 111-112
Phi Beta Kappa, 96-97
Phi Lambda Upsilon, 97
Philosophy, 295-298
Photography, film and, 155-160
Physical Education, See Human Performance and Health Sciences
Physics, 298-304
Pi Delta Phi, 97
Placement Office, 102
Policy Studies, 63
Political Science, 304-310
Portuguese, 333
Prebusiness, 64-66
Preceptors, Architecture, 139
Civil Engineering, 192
Predentistry, 64-65
Prelaw, 64-65
Premedicine, 64-65
President's Honor Roll, 73
Probation, academic, 73
disciplinary, 74
Professional degrees, 106-109
Professional research staff, 44-46
Professorships, 50-52
Programs, undergraduate, 58-68
Psychiatric Service, 100
Psychology, 310-314
Readmission, 74
Refund of fees and tuition, 82
Registration, 68
Regular decision plan, 78
Regulations, academic, 68-75
Rehabilitation, vocational, 87
Religious Studies, 315-319
Requirements, course, 54-55
distribution, 55
skills, 56
Research degrees, 105-106
Research staff, professional, 44-46
Reserve Officers' Training Corps, 66, 277-279, 293-294
Residential colleges, 98
Responsibility, student, 97, 118
Rice Center, 110
Rice Memorial Center, Ley Student Center, 101-102
Rice Players, 100, 160-161
Rice Service Award, 99
Rice Tutorial Program, 75
Rice University Associates, 7-12
Rice University Standing Committees, 50
Russian courses, 251
Scholarships, graduate, 114-117
Scholarships, undergraduate, 87-96
Senate, student, 99
Sewall Art Gallery, 151
Shepherd School of Music, 62-63, 109, 279-293
Sigma Delta Pi, 97
Sigma Xi, 97

Skills requirement, 56
Slavic Studies, 250-251
Social Sciences, School of, 59
Sociology, 320-324
Space Physics and Astronomy, 324-328
Spanish, 329-336
Special academic probation, 73
Special charges, 82
Sports Clubs, 103
Sports, intramural, 103
Staff, administrative, 6
  Athletic Department, 48-49
  Health Service, 48
  Institute for Computer Services and Applications, 48
  instructional and research, 13-44
  library, 46-47
  professional research, 44-46
Standing Committees, 50
Statistics, 109, 336-339
Student activities, 99-100
Student Association, 99
Student Association Service Award, 99
Student Center, 101-102
Student employment, 87
Student government, 99
Student Health Service, 100-101
Student housing, undergraduate, 81, 98
Student life, 97-103
Student loans, 86
Student organizations, 99-100
Student responsibility, 97
Student Senate, 99
Student teaching internship, 183-184
Studio art, 150-151, 155-160
Summer school, transfer credit, 69
Suspension, academic, 73-74
Swarthmore exchange program, 67
Tau Beta Pi, 97
Tau Sigma Delta, 97
Teacher certification, 66, 181-182
  fees, 83
Theater, 160-161
Thesis regulations and procedure, 113
Transcripts, 83
Transer students, 80
  admission of, 80
  credit, 69
Trinity College (Cambridge) exchange program, 67
Trustees, 4
TSU cooperative program, 67
Tuition, graduate, 113-114
Tuition grants, graduate, 114-117
Tuition refund, 82
Tuition, undergraduate, 81
Tutorial program, 75
Undergraduate admission, 75-81
Undergraduate approval of majors, 56-57
Undergraduate curricula, 54-66
Undergraduate fees, 81-82
Undergraduate living expenses, 83-84
Undergraduate scholarships, 87-96
University Associates, 8-12
University of Texas Health Science Center in Houston: joint graduate program in medical ethics, 110
University Campus and facilities, 1
University Standing Committees, 50
Visiting students, 80
Vocational rehabilitation, 87
Wiess School of Natural Sciences, 60, 63
  See also Biochemistry, Biology, Chemistry, Geology and Geophysics, Mathematics, Physics and Space Physics and Astronomy
Withdrawal, voluntary, 74

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NOTES

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